Engineering Library

In This Issue—*Efficiency in Dealer Buildings*

JUL 21 1922

MOTOR AGE

Vol. XLII
Number 3

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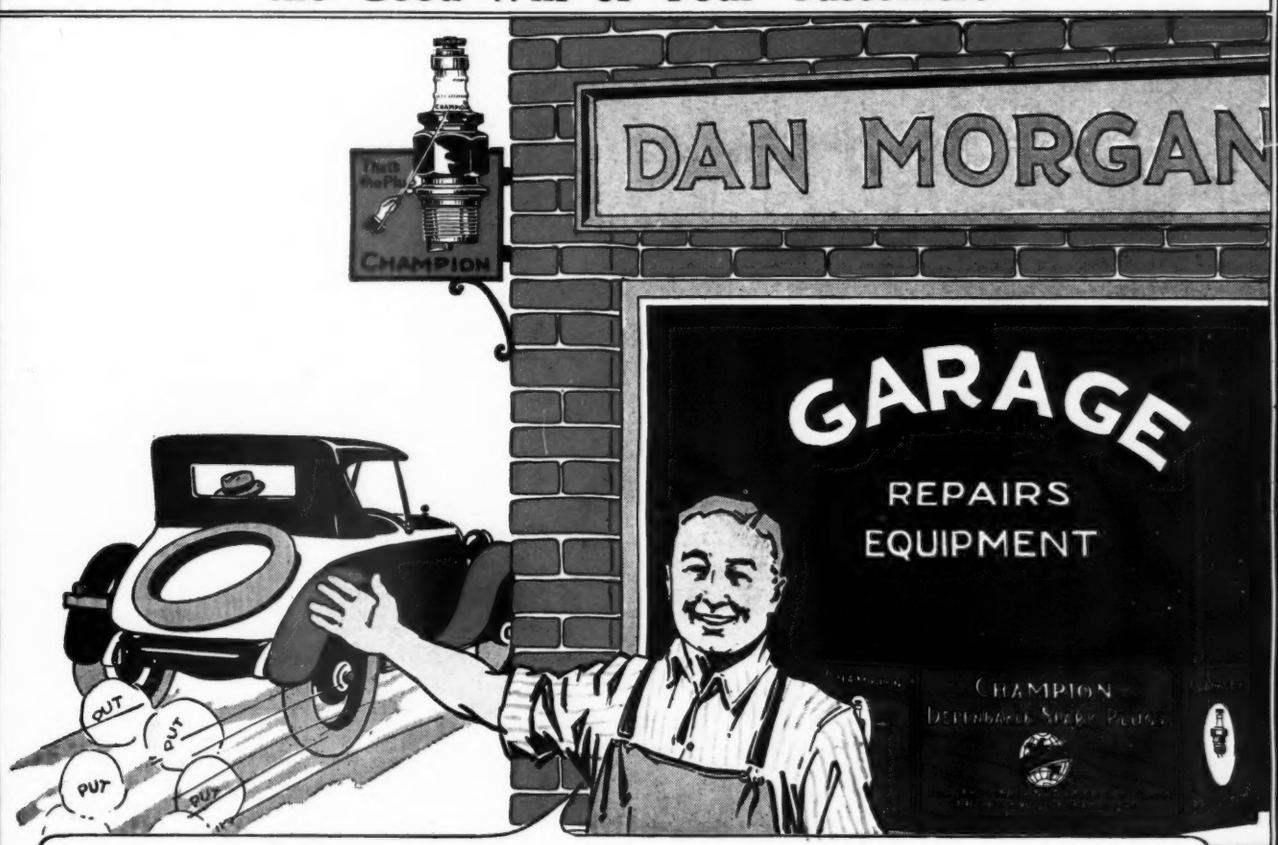
CHICAGO, JULY 20, 1922

Thirty-five Cents a Copy
Three Dollars a Year

You Can Replace Anything Except the Good Will of Your Customers



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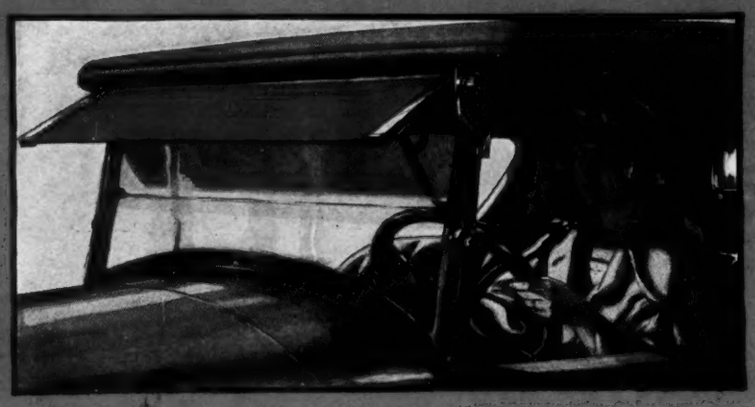

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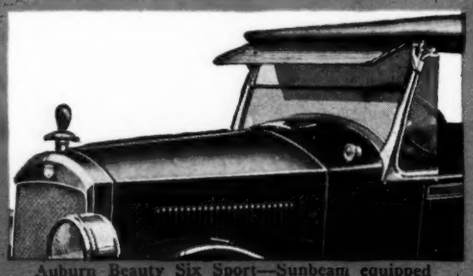

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This handsome display stand furnished with each Star Account order—6 or more Sunbeam Visors.

MOTOR AGE

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CONTENTS

Laying Out the Dealer Building for Economy and Efficiency 9
By Tom Wilder

Orderliness Has a Cash Value; Disorder Carries a Cash Penalty 14
By B. M. Ikert

Electrical Trouble Shooting 17
By A. H. Parker

What the Fairy's Wand Did to the Used Cars 18
By John Rooks (Practical Garageman) and James V. Malone (Writer)

New Offerings in the Car and Truck Field 20

An Ideal Electrical Service Station in the Making No. 1 22

Gee! Don't You Feel Chesty?—A Cartoon 23

The Value of Show Window Appeal 24
By Frank Ballard

Editorials

Using Your Customer's Credit 26
Plenty of Speakers 26
A Safety Suggestion 26
If the Coat Fits 27
Undesirable Customers 27
The Pants Pocket Bank 27
The "Yessir" Salesman 27

News of the Industry

F. Nazzaro Wins Grand Prix Race 28
Voisin Knight Type Wins 444 Mile Gasoline Test 28
Sales Increase in Farm Sections 29
Gasoline Prices "Juggled," Says N. A. D. A.; Gives Figures 30
Ten-Story Motor Hotel Plans for Chicago Nearing Completion 31
Six Companies Announce Several Price Changes 31
Retail Sales Maintain High Level in Cleveland 32
"Help Yourself" Garage Coming to Kenosha, Wis. 32
High Level Maintained by Retail Sales in Milwaukee 34
Dealers Opposed to Taking in Used Cars Have Another Plan 34
"Shop Profits" Campaign of A. E. A. Is Under Way 35
Farmers Enjoying Added Prosperity Down K. C. Way 36
In the Retail Field 37
Business Notes 38
Concerning Men You Know 38

The Readers' Clearing House

Responsibility in Case of Fire While Filling Car's Tank 40
What Caused the Explosion? 40
Good Two Story Layout for 50 Ft. Inside Lot 41
Questions on a Haynes 42
How to Make Electric Oven for Softening Batteries 42
Valve Timing of Marmon 43
Gas Consumption of Liberty Aircraft 44
Gear Ratios of Essex 44
To Settle a Wager 44
Reasons for Noisy Tappets 45
Cause of Burnt Electrodes 45
Some Points on Engine Timing 46

The Accessory Show Case 47

When Is a Ground Not a Ground? 48

Coming Motor Events 49

Specifications of Motor Trucks, Tractors and Cars 50

Index to Advertisers Next to Last Page.

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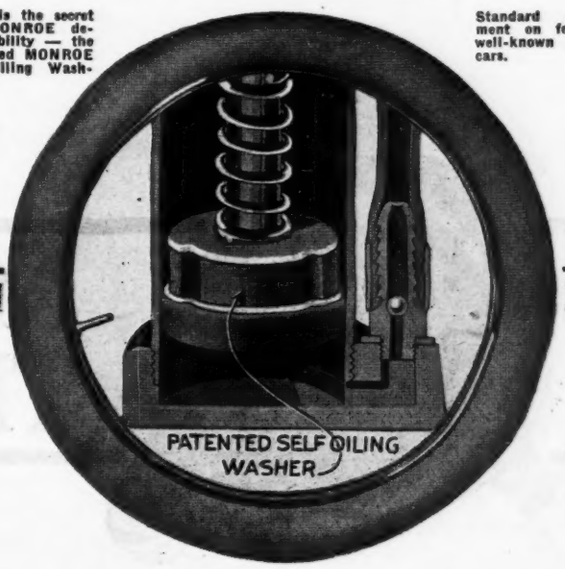

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He wants quick turnovers, with little money tied up in stock. That's the way to beat the accessory game! He started with $600 three years ago. His 1920 sales were $40,840.34!

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"Replying to your very much appreciated letter of the 25th inst., would say you can just bet Milwaukee Timers are on the shelf and in our show case also, and the only thing we have 'agin 'em' is that 'they sell' and then we are put to trouble of troubling Bowman of Detroit for more."

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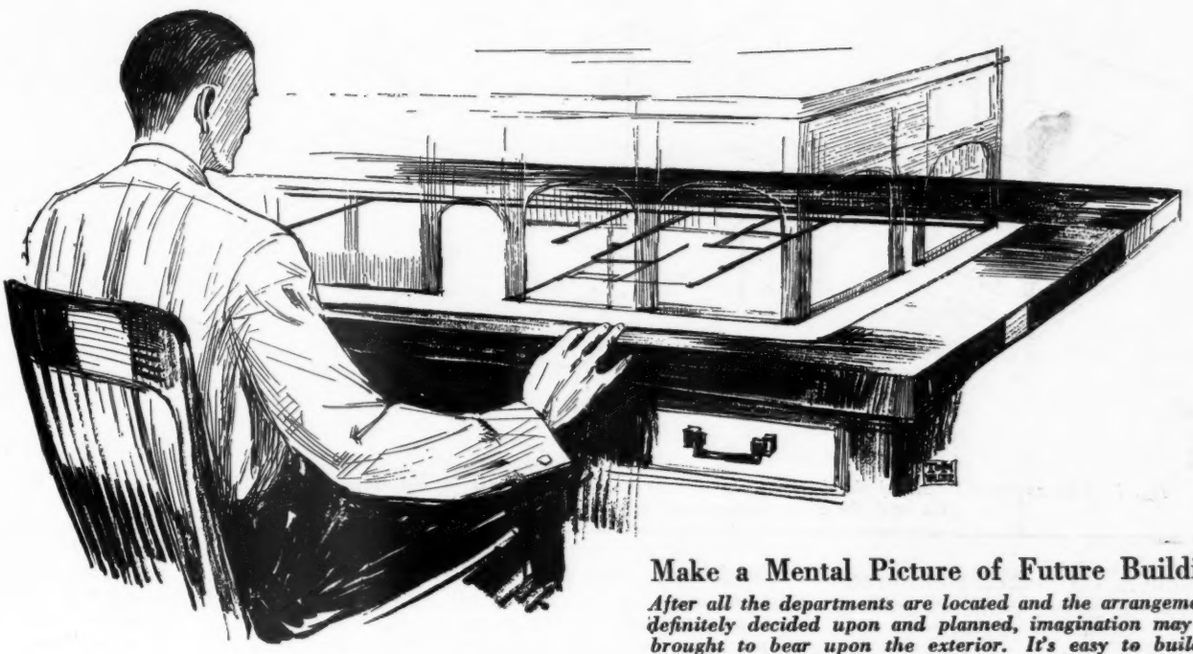


Make a Mental Picture of Future Building

After all the departments are located and the arrangements definitely decided upon and planned, imagination may be brought to bear upon the exterior. It's easy to build a good looking building on a good plan for a foundation, but it's hard to dress up a poor plan behind a good front

Laying Out *the* Dealer Building *for* Economy *and* Efficiency

A Number of Things to Think About—Best Methods of Planning New Structure—How Space Can Be Allotted to Each Department

By TOM WILDER

LAYING out the new building is a delicate and serious operation. As when taking the Marriage Vows or choosing the site of the Summer Vacation, one should always look carefully before one leaps. It would naturally be supposed that one in the business of selling and servicing cars would know better than anyone else how the job should be done. On the same theory a woman would be supposed to know how to lay out her kitchen but many try and make miserable failures of it. Some women succeed, of course, and likewise some dealers succeed but the average dealer is about as adept at the job as he would be at tight rope walking or designing millinery.

If he is in a small town, he usually builds a large open trussed roofed building with a car entrance in the center of the front and trusts to luck to divide the interior as use demands. In the larger cities he consults an architect who erects a large, open, well-constructed building, also without thought for the interior which the owner must subsequently adapt to his use as best he can. It is always a good building but it is usually as suitable for use as a shoe factory as a motor car dealer building.

But merely finding fault with

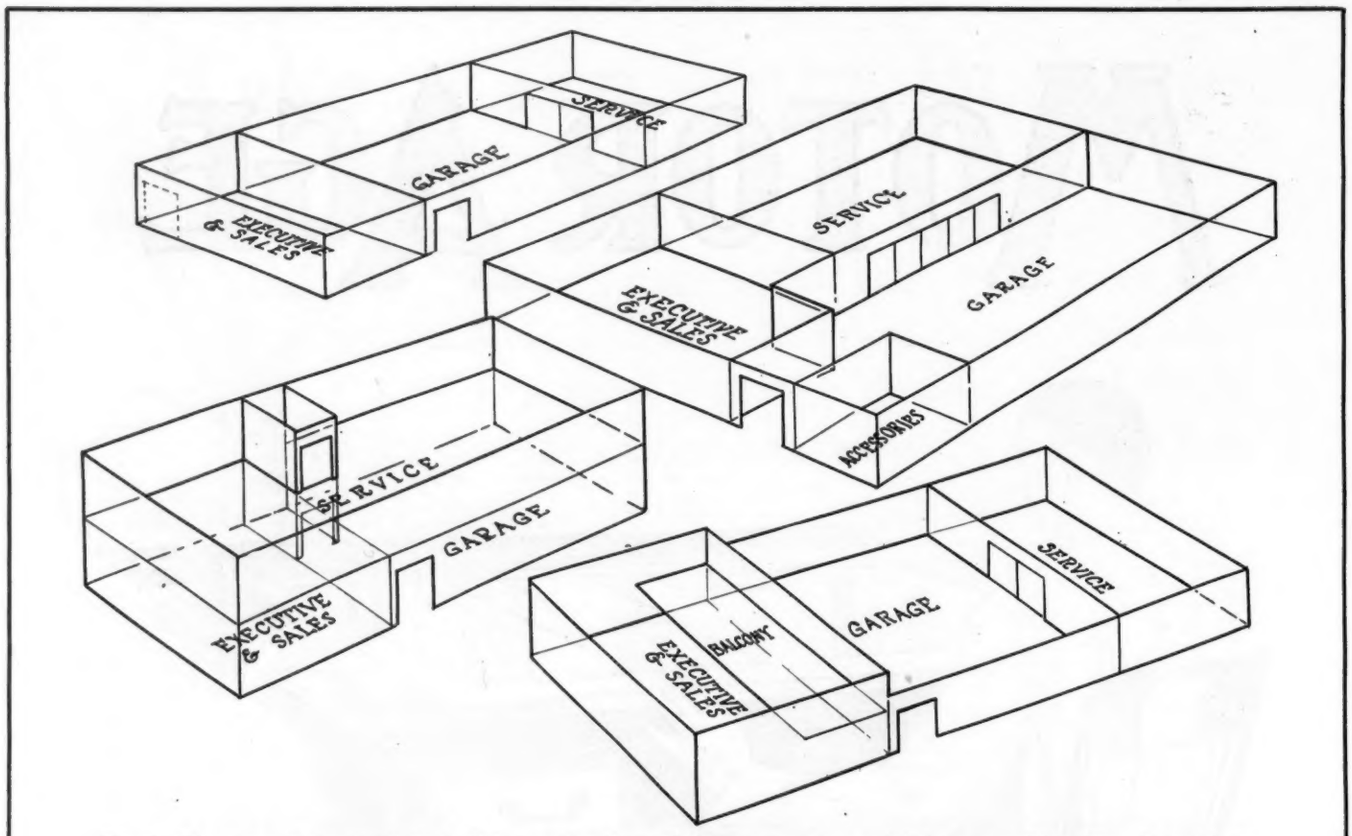


Fig. 1—The apportionment of the building to the three divisions must be as simple as possible. The shape of the lot and the size of the building affect the division of space materially

what others do makes poor headway towards a better understanding of the problem. Perhaps it is better for those who cannot hope to succeed to employ an expert; but experts in this line are hard to find and it is in the hope of helping out those few that these few simple rules and suggestions are offered.

How to Start

When we start planning the building we must have a pretty definite idea about the amount of space each department must contain. If we have a showroom, we know how many cars we want to accommodate and know roughly that each car should have from 200 sq. ft. to 500 sq. ft., according to whether it is packed in tight or has space around it so that the customer can stand off slightly and look it over. New cars should have 500 sq. ft. at least. Used cars may be limited to 200, though 300 sq. ft. is better.

We should go from one department to another estimating its minimum and maximum size and being sure to include all necessary aisle and waste space so that when we are finished we will not be crowded. Thus, a stenographer needs only about 16 sq. ft. for her desk and chair, but she needs half or two-thirds that much additional space for passage to get to her desk. Then figuring extra chairs, tables, filing cabinets, etc., which general offices must contain, the approximate space per person will be brought up to close to 50 sq. ft.

If we plan to have a garage, we must allow at least 6½ ft. for each car width with an aggregate of 165 ft. to 200 sq. ft. for each fair sized car stored, dead storage.

Space in service stations runs higher, as there must be room to work around the cars. Here 200 sq. ft. should be the minimum space per car; 300 sq. ft. is not out of the way where there is considerable equipment.

The paint shop will need 180 sq. ft. per car at least. Battery electrical equipment, radiator repair and tire shops will have to be estimated according to the volume of business, but they can be made rather small unless there must be garage service in connection. Stockroom space will likewise have to be estimated according to the individual needs, rather than by any set rules.

If More Space is Needed

Very valuable tire stock, for instance, may be stored in a rather small space. Large stocks of accessories and parts are easily packed away in spaces little over twice their own volume, the extra spaces being for aisles and passages. After

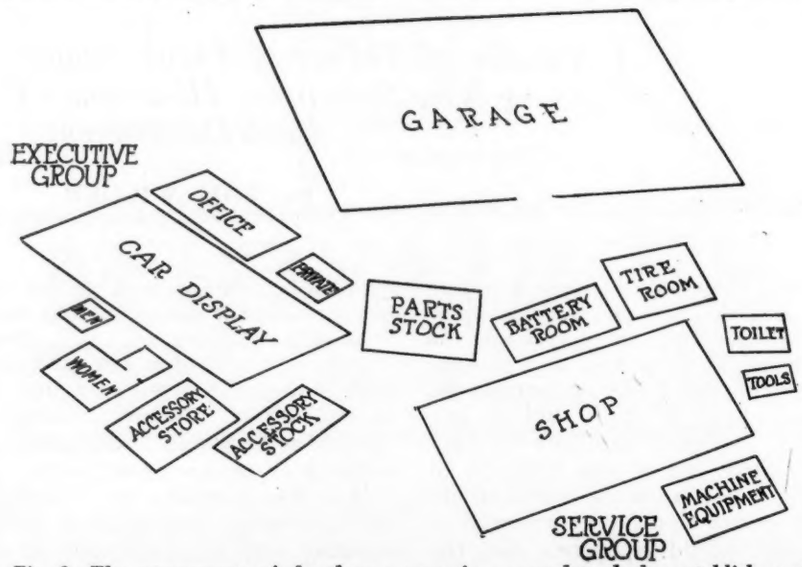
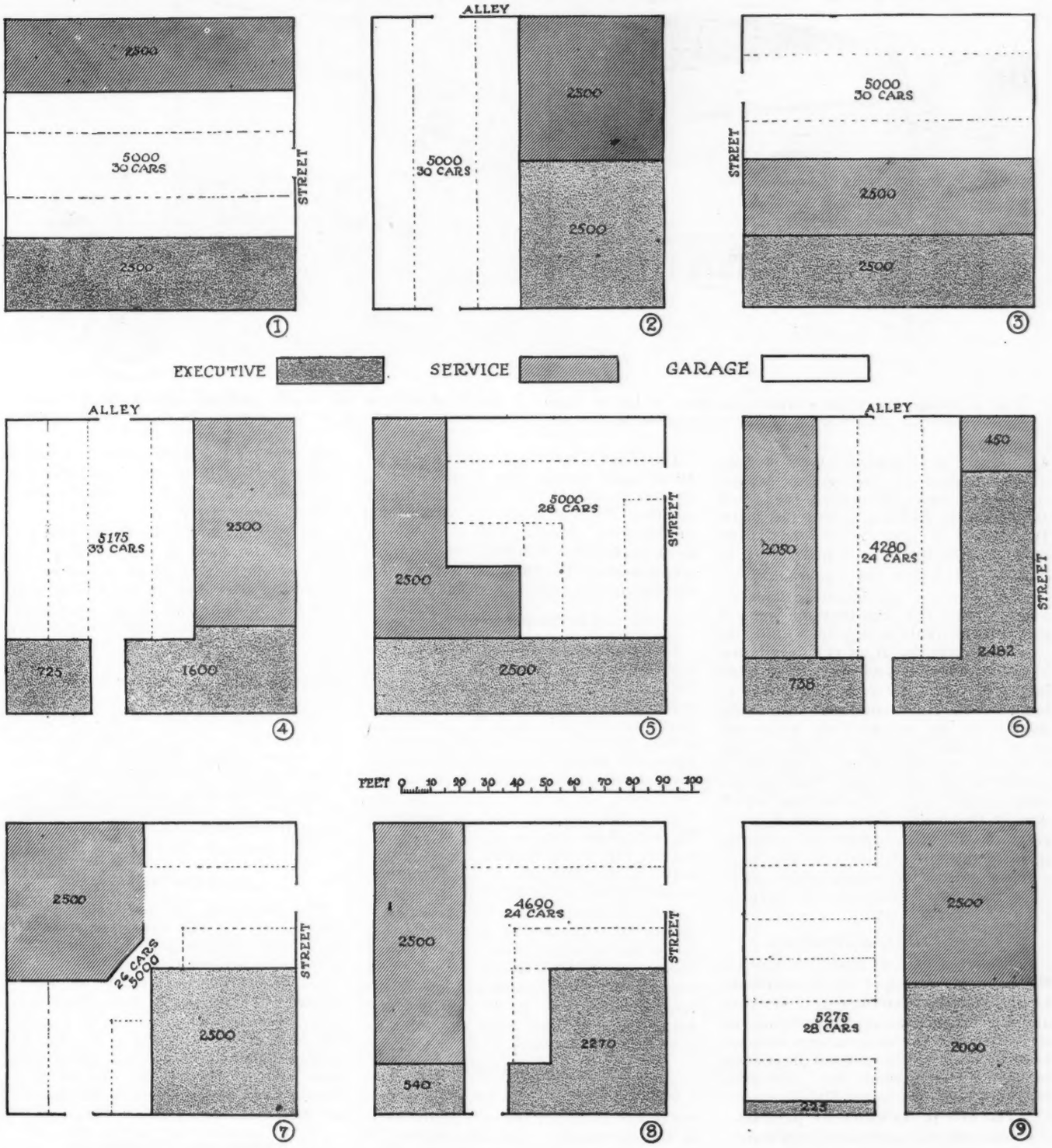


Fig. 2—The components of the three groups in a complete dealer establishment are here shown in their average proportion but in exploded form

Nine Suggested Building Arrangements on a Lot 100 x 100 Feet



The 9 diagrams shown here are all layouts for a dealer building on a lot 100 ft. by 100 ft. They are all placed so that the side nearest the reader is the front, or faces main street. Some of them are on a corner, some have one garage entrance and some have two. Some are on inside lots; some have alleys at the rear.

All the service sections contain 2500 sq. ft. Most of the executive sections contain 2500 sq. ft. and most of the garages 5000 sq. ft., but some of these latter two were varied slightly of necessity.

The three upper layouts are simple while the four lower ones are more complicated. They are all practical, however, and give an idea of the amount of variety possible on any piece of land as large as this. If the lot were larger the number of possibilities would be greater, while with smaller pieces the good arrangements are about in direct proportion to the size.

While all are practical, some are much better than others. Numbers 1, 4, 5, 8 and 9 should all work up into excellent buildings.

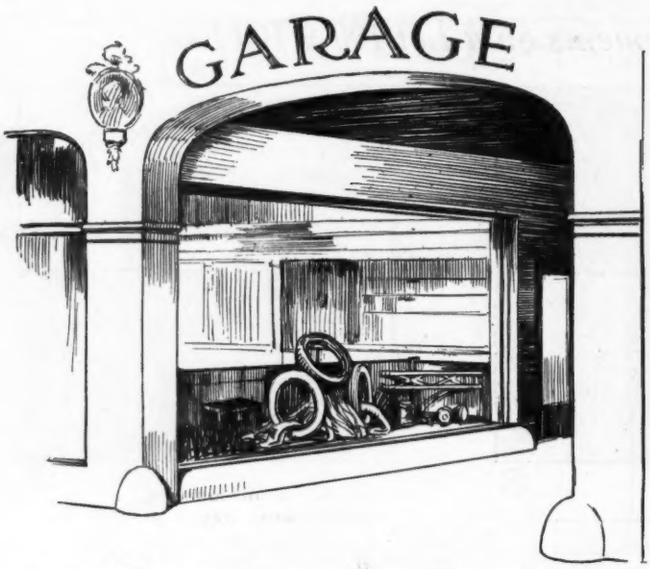


Fig. 3—While the front entrance sacrifices a lot of show window space the space can sometimes be reclaimed in this way

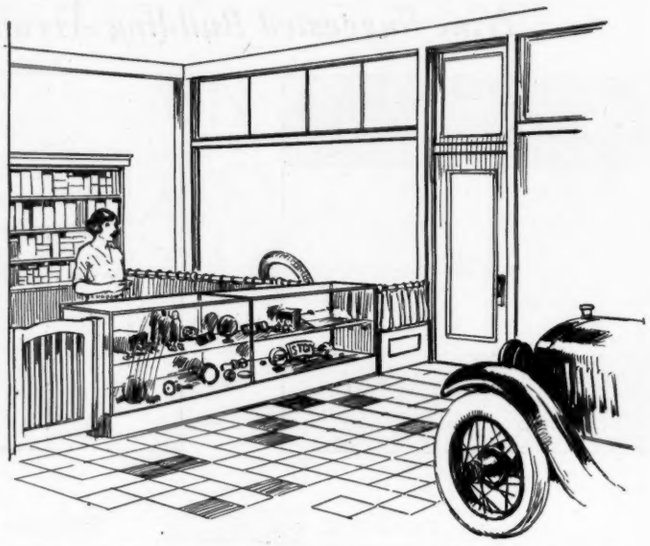


Fig. 4—A desk or two in the enclosure behind the accessory showcase is sometimes all that is necessary in the small garage

we have a complete list of the areas we need for the various departments and have determined the grand total we may find that it will just equal the size of our lot. More likely, however, we find that it is a half larger or double. What then can we do?

If it is only a half larger perhaps we can cut down here and there on some of the non-essentials and keep within our prescribed size, but if we run over to the extent of doubling and there is no more land available, the easiest way out is to build a two story building. We might do this in the former case, using the extra half floor for dead storage, renting it out or merely holding if for future growth or emergency use. One garageman utilized half of a lower floor which was at that point, below grade to store potatoes. Farmers brought the potatoes in after the fall harvest and they were shipped during the winter when prices were high and snow was too deep to get them off the farms.

Three Principal Divisions

Considering that we have now reached the point of arranging the departments, having already determined their sizes and the proportions of the building, let us try to put the departments in some kind of order. The general dealer establishment as a whole has three principal divisions or groups, Fig. 1.

The first is the executive part, including offices, salesrooms, accessory store and stock, customers' accommodations, etc.

The second is next in importance and includes all repairshop activities, parts stock, tool stock, etc.

The third is the garage section; while it is often larger in floor space than the other two combined it may be smaller than either or disappear entirely.

The diagrams Fig. 2 show a number of characteristic combinations of these divisions to suit large and small business on different shaped lots.

Our next step is the splitting up of these main groups into their units so placing them that they are in the proper relation to one another and to the units of the other groups. This is of the utmost importance as upon these arrangements depends the efficiency of the whole institution and efficiency means money.

The Showrooms

Starting with the executing group, the showroom is the principal feature and there is no alternative; it must extend across the front, though it may relinquish part of the space to accessories if they are to be handled. It is quite as important to have the accessory store in contact with the street as it is the car showroom. If there is a front car entrance, the display space is restricted but advantage can be taken of the situation, Fig. 3, by making the partition between the entrance passage and the salesroom an accessory display window.

While formerly it was considered good to put the entrance in the middle, between the accessory store and the showroom, this idea is going out of favor since it divides the space and lowers the tone considerably; it is all right and perfectly permissible when the frontage is sufficiently extensive, 75 ft. or over.

The Offices

The offices are usually next to arrange and naturally they are at the back of the showroom or, in small places, in connection with the accessory store where the show cases often form their boundaries as in Fig. 4. In this immediate vicinity, too, comes customers' rest and waiting rooms, private offices, conference rooms, toilet and coat rooms, in fact, all the odds and ends which must be near the offices.

The accessory stockroom is also a problem to be handled here and one that is always hard to solve. If it is to be a large institution which warrants a special stock keeper, the accessory stock may be combined with the parts stock and kept on the second floor. A dumb waiter will give the store good service, and save the ground floor space for more urgent needs.

Where there are large offices and limited area for them on the first floor, the general offices may be on a balcony or above the showroom on the second floor and the limited space on the main floor reserved for salesmen. The balcony idea is more applicable to a one story building than a building of two or more stories, since the front of a one story building may be raised to give headroom in the balcony whereas in a building of two stories, it is not advisable to raise the whole second floor merely to gain a few feet in a very small area.

A grand stairway leading to the balcony or to the second floor is an architectural feature of some value in decorating the showroom, Fig. 5.

Used Car Display

The showroom for used cars sometimes comes in this executive group. It is always well to get it as near the salesrooms as possible for the convenience of both customers and salesmen. Often in buildings of more than one story, the used car section is just above the new car showroom and reached by a convenient stairway. Too often used cars are not given the display they should have but are kept in the garage where they make a poor showing.

Maintenance Department

The second group, as before stated, includes all the repair and service activities. In the one story establishment of average proportions it is at the rear of the building where it has the advantage of the alley windows, if there is an alley, and where it is away from the interruptions of the sales department and garage.

In buildings of two or more stories, the repair shop should be on the top floor where it gets all the light and is most secluded. Light is a most important feature in the repair shop—good work

Fig. 5—There are so many good examples of the mezzanine or balcony office that we are using a photograph instead of a sketch

cannot be done without it—men are not efficient without it and neatness and cleanliness are simply absent in a dark shop.

In buildings of several stories, where the service departments are too extensive to be confined to one floor, the light sides of the building on lower floors may be used for the smaller departments. Battery shops, electrical shops, tire and radiator shops, trim shops, and sometimes even paint shops may be taken care of on these floors to good advantage. All the more important work of overhaul, however, should be done on the top floor where the ample light afforded by skylights will insure good work with a minimum of effort.

The parts stock comes in this group, but as many parts are sold without service it naturally overlaps on the executive and sales group. It is important to have the parts stock handy to the shop, as otherwise there is a great waste of the mechanic's time. Consequently, the parts customer is the one who does the traveling and he is usually glad to do it if the stockholder gives him prompt service. Provision should be made to give the customer access to the stockroom counter, but keep him from the shop. If this is too difficult, it may be better to handle parts sales along with accessories and deliver the parts to the store by dumbwaiter as they are asked for.

Storage Section

The last group to consider is the garage group. But while its importance is last, it must really be considered first and located quite definitely since it is the largest user of space and must have space in large areas to permit the easy handling of cars.

If it is planned to do a live storage business, that is, storing cars for owners who have them in and out every day, it is advisable to have all cars accessible to aisles. That means that the cars must be placed on both sides of an aisle and must have a space in the neighborhood of 50 ft. wide. The aisle must be just as wide whether cars are parked on one or both sides, consequently, the most economical method is the center aisle with cars each side.

In the average garage built on a 50 ft. lot the walls are one foot thick, which leaves 48 ft. clear space and this is about the minimum for easy handling and 50 to 53 ft. clear space is better. Fig. 6 gives a graphic illustration of the different available widths and the accompanying table gives the amount of floor space per car required in each layout. It is obvious that the more cars are doubled up, one in front of the other, the more economical will be the storage.

Economy and desirability are at variance, however, and unless there is practically certain to be a definite amount of dead storage, it is best to keep all cars accessible and plan the space to that end. It does not pay to try for too much economy as the time spent in juggling cars will eat up more than the gain and your garage will be unpopular, besides.

Occasionally there are cases where storage is a larger item than usual and here it is common to devote a whole floor to this purpose. Rather than fill the shop with stored cars, it would be advisable to have basement storage facilities. It is quite common in buildings of two stories and basement to devote the part of the first floor remaining from the executive group to storage. This includes demonstrators, service cars, etc., but the most of the storage will be in the basement and the main floor part will be reception hall or clearing house for storage, service, and similar purposes.

During the summer months basements are apt to be damp, not from seepage of water but from condensation of atmospheric moisture on the cooler walls and surfaces. Their use for any purpose but live storage is discouraged. Parts and accessories must never be kept in the basement. Rust and mildew are always present.

Plan to Scale

As we stand then there are certain conditions that must be fulfilled by the areas allotted to each of the three groups and it is by a process of playing checkers with the space that each group gets the space most appropriate. On page 11 is a series of thumb nail sketches for a building 100 by 100 ft. which show how this may be done and it is well to remark in passing that these little sketches should always be laid out to scale, at least in their main proportions, otherwise we may decide on a beautiful plan only to find it impractical when enlarged and perfected.

Since, to our knowledge, there are no two building layouts in the United States exactly alike, it is quite useless to give plans and expect anyone to find one to suit his conditions among them, but if we can point out the method of procedure and illustrate with a number of plans, perhaps the reader will be able to proceed with the solution of his own problem.

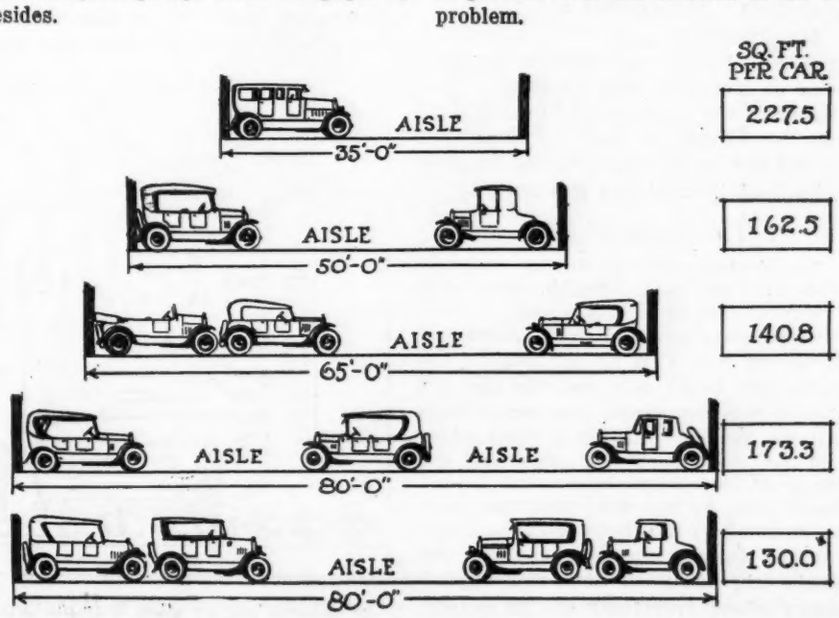


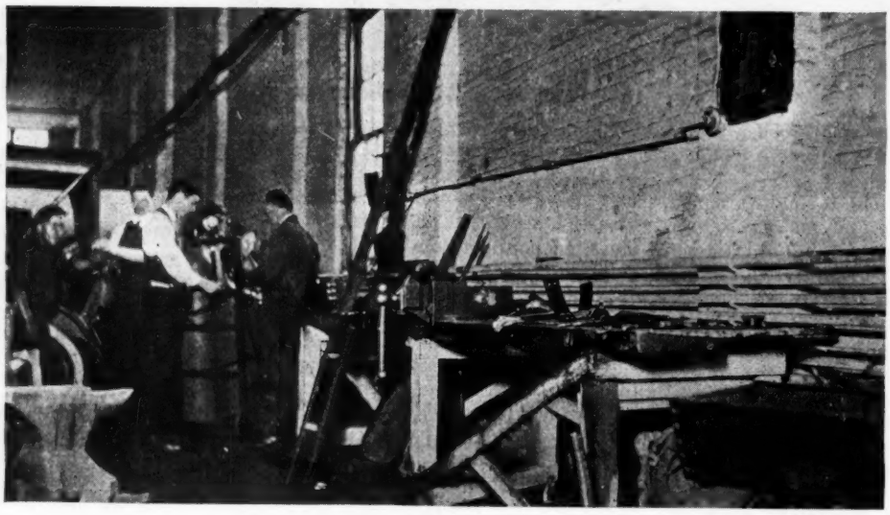
Fig. 6. It is easy to see by this diagram that the builder of a garage less than 50 ft. wide pays the penalty for his folly

Orderliness Has a Cash Value; Disorder Carries a Cash Penalty

The Shorter Time Necessary to Complete the Job, the Value of a Pleased Customer and Smaller Overhead Often Are the Difference Between Profit and Loss

By B. M. IKERT

RECENTLY a dealer made a statement about a condition which existed at the time in his maintenance department and which statement is one that would fit conditions in many hundreds of automotive shops at the present time.



What you see in many automotive shops today, disorder and confusion. Look at the bench! Can you expect a mechanic to do good work on a littered bench like this? A good mechanic, in fact, would not tolerate a condition like it. It would take about 10 minutes to clean off this bench

This dealer seemed very much perturbed at his misfortune; yet he was largely to blame for the state of affairs. His, like many other shops, was not working to a plan. He was busy, yes, but he could easily handle more work if he had a definite mode of operating. But to get back to the statement. His trouble was:

He pointed to a car from which the engine had been removed for the purpose of installing new bearings. The owner of the car wanted to use it during the Fourth of July holidays, but he did not get the car because the man who had started the job was ill.

The Scattered Parts

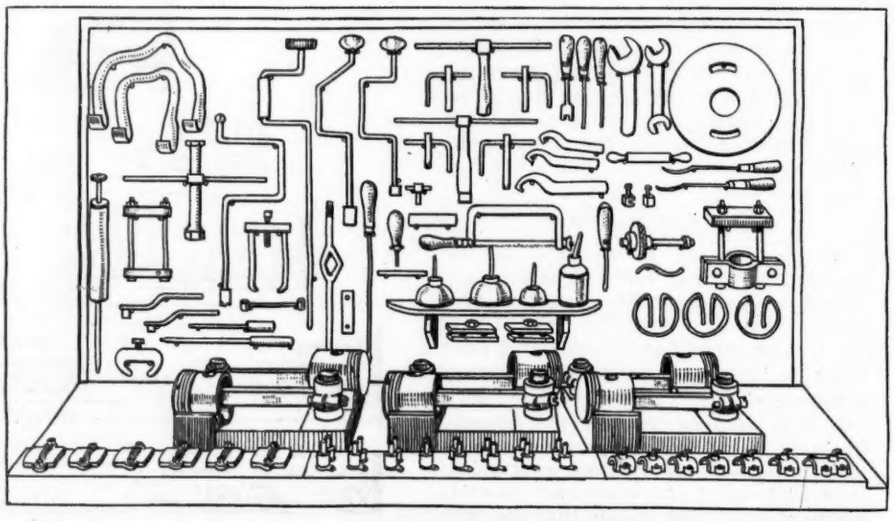
The dealer was asked why someone else could not finish the job. His reply prompted this article. He said:

"Well, Dave took the engine down and he knows just what he did with all the parts. He is the only one who can put the job together again. See here. Here are the keys for the pump shaft gears and the Lord knows what the others are for, in his jumper pockets. And, I don't know what he has done with the main bearing shims. So there you are. Don't you see, Dave is the only one who can do the job, because he took it down and knows where everything is. Of course, the customer is kicking like a steer, but you see what I'm up against."

In many shops there are men who have developed as specialists along certain lines. One is especially well adapted for bearing work; another for engine tuning; a third for electrical work. It is good practice to have these men work along such lines and so plan the work that it will fall to the right man in the course of shop routine.

But, specialists, or no specialists, it should be possible for another mechanic to complete a job. Except in detail, there is no great difference between one six-cylinder engine and another, or between one rear axle and another. A competent mechanic, therefore, should be able to size up a job which is under way and carry it to completion. He can't do it, of course, if he is unable to find the parts and especially will he be unable to do it if the parts, such as valves and rockers, have not been properly laid out as to their relative positions.

After the dealer quoted had told of his troubles, we went around the establishment to collect evidence. It was the old story of dirt and disorder. No attempt was made to speed up the work or work



In aviation engine work it is the practice to arrange all parts in an orderly manner, as shown here, as they are taken from the engine. Note how the pistons and rods are supported, the valve covers, bearing caps, etc. The tool arrangement speaks for itself

along the efficient lines that make the better class mechanic; the man who helps make maintenance pay.

There is little use in describing conditions as they existed in that shop. Let it suffice to say that the shop was fitted with cars in various stages of repair, with hardly sufficient room between them for a mechanic to work. Parts, rags, tools, cans of oil, grease and even a family cat were in evidence on the running boards of cars, on the floor, benches, window sills and even the ways of the lathe had some heavy parts resting on them.

Here, indeed, was a shop that could boast of nothing more than that it had plenty of cars in it to be repaired. No wonder the dealer wrung his hands because Dave was ill and the customers were mad because they could not get their cars.

Time for Action

That dealer should not wring his hands and consider himself in hard luck.

It would be far better for him to sit down, take a sheet of paper and pencil and jot down the things he is going to do to establish method in his shop. He is located in a comparatively small town and should be able to do a good business, because as he said:

"I get work from all over the neighborhood and keep pretty busy the year round." He needed not a larger place but efficiency in the place he had, so that he could not only handle his present volume of work profitably, but put himself into a position to reach out for more business, with the same overhead.

It is possible to learn many lessons in tearing down and reassembling engines from the government air service maintenance departments. No attempt ever is made to disassemble an aircraft engine until proper facilities are at hand. These facilities include an engine stand, tools and racks, shim boards, piston supports and other equipment, all designed to receive the parts as they are taken from the engine. Such a tool and parts arrangement is illustrated on these pages.

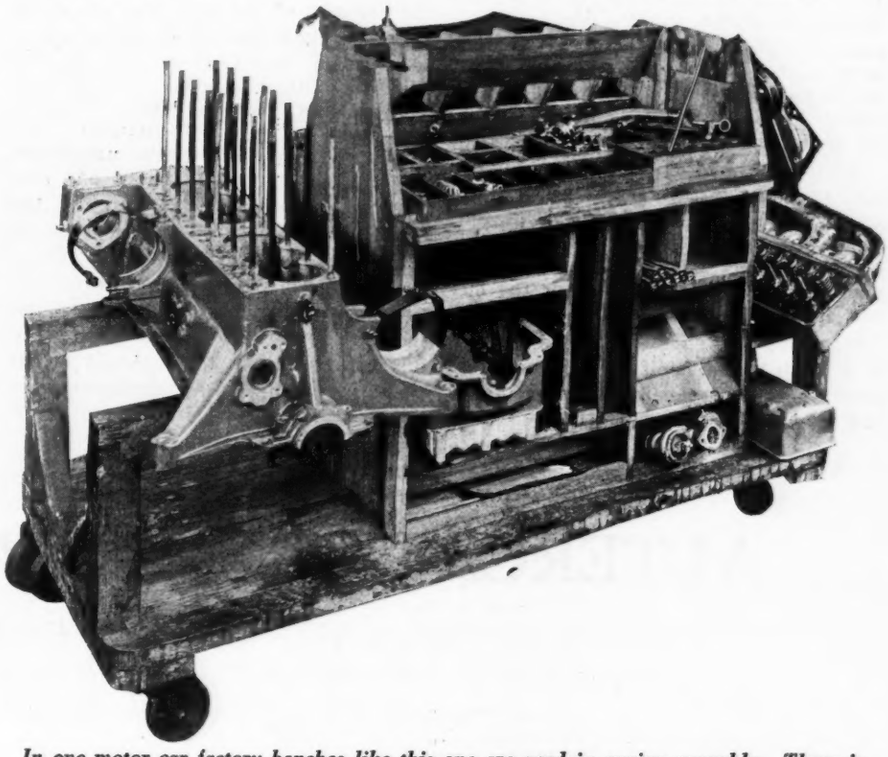
There is no good reason why automotive mechanics should not work along similar lines. As a suggestion, it might be possible to construct several benches which can be moved about the shop and which are built with the idea of receiving all the parts of the engine as it is taken down. In this way every man in the shop would know exactly where to find every part of such an engine. He would know that the various gaskets are in the drawer intended for them. He would know that the valve and valve parts are arranged in proper sequence, that the cylinder head stud nuts are all together and that the carbureter fitments are intact.

A Well Ordered Shop

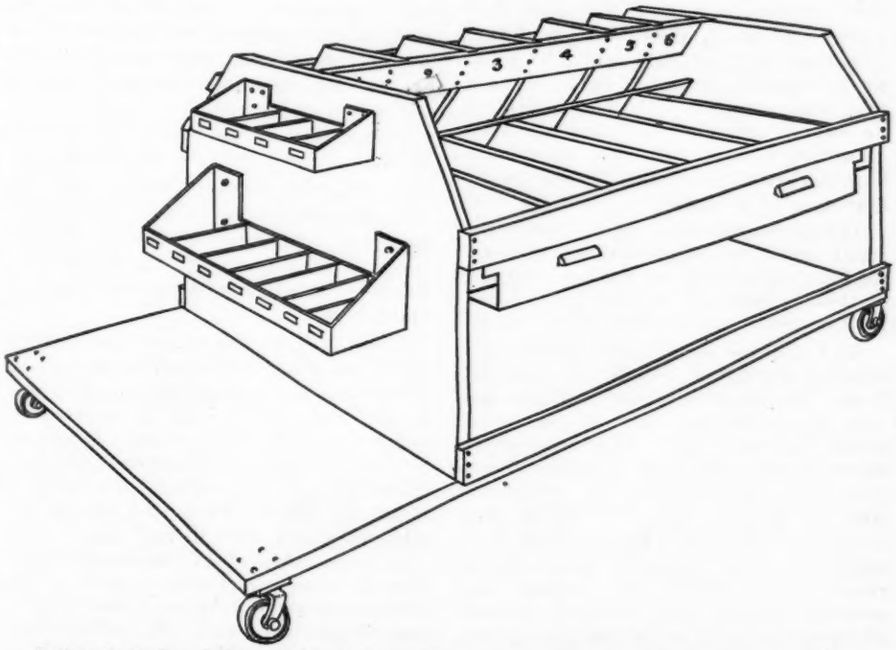
These portable benches take up very little room and certainly would make for a tidy shop, to say nothing of the time saved in getting the job done more quickly. A workbench along the wall is too often accepted as a fine resting place for parts and tools and before one realizes it, there is such a hopeless jumble of stuff on the bench that a mechanic is better off to install a new part rather than look for the old part hidden among tools, bolts, and oil cans.

In the absence of such benches, it is possible to provide racks and parts trays to fit under the work bench. This keeps the top of the bench clear of parts and insures keeping the parts off of the floor. The floor in too many establishments serves as the workbench, and for storage of parts. When you add to this the dirt, oil and grease from cars and trucks being worked on, it is easy to see that

Applying Production Methods to Maintenance



In one motor car factory benches like this one are used in engine assembly. There is a place for every part and the man knows just where to find it. It is a production proposition, of course, but the idea lends itself admirably to the maintenance shop



A shop built bench like this would facilitate engine repair. The top supports pistons, valve parts, etc. The crankcase or block rest on the extended bed, bolts, nuts and washers in the pockets on the side, gaskets in the drawer and miscellaneous parts like carbureter, etc., under the drawer

things become pretty messy in short order and the shop morale is soon shot to pieces.

Flat Rates and Orderliness

The arrangement of the shop, particularly the handling of the parts as they come off of the engine, or any other unit, has a direct bearing on the proper application of the flat rate plan. The flat rate will not operate successfully unless there is system and order in the shop. To get the lowest possible cost on a repair operation, it is essential that the units be torn down and reassambled in minimum time, which only can be accomplished when there is a definite place for each part as it is taken off.

What applies to parts, applies equally well to tools. If all benches used by the mechanics are departmentalized in the same way, it makes for speed for all concerned. There should be one place for hammers, another for drills, for the oil can and speed wrenches.

Where but one make of car is serviced, it is much less difficult to plan tool and parts racks and benches as everything can be built to accommodate only the special tools. But, where all makes of cars are worked on, the job is more complicated. For example, the cylinder head space must be large enough to accommodate the largest head which is likely to come into the shop. Then, too, the number of wrenches and similar tools will be greater.

The tonneau or running boards of a car should never be used as a storage place for parts or tools. Mechanics often put clutch housings and similar parts in the tonneau of the cars they are working on. Their thought is, of course, to keep such parts close to the car to which they belong. It is easy to see how this is likely to prove disastrous when the customer finds grease spots on the carpet or upholstery. Many a clean running board has been hopelessly stained by a careless mechanic resting his soldering acid pot, or messy tool kit upon it.

Clean Shop Benches

The customer's car is not left in the shop as a work bench or parts tray. Benches and parts trays should belong to the shop. But, unless the benches are clean, the mechanic is likely to resort to the running board, fender or some other place to do his work. Eventually, we have the same condition as the dealer to whom we referred at the beginning of this article.

Try the parts bench idea and see if it does not help you in MAKING MAINTENANCE PAY. If you think you do not need them, just look around your shop today and notice the floors, the benches, the cars and then ask any mechanic how soon he can finish the job John started.

PLANS FOR MOTOR TOURIST CAMPS

Dealers everywhere are, or should be, interested in the proper layout of the automobile tourist camps in their neighborhood. These camps are making for the wider use of the motor car and dealers should encourage them. In the past it has been necessary to work rather blindly in the layout and equipment of these camps. Now comes the Portland Cement Association of 111 West Washington street, Chicago, with layout and equipment suggestions. These are for distribution to those interested in the promotion of such camps.

ALTERCATIONS A SPECIALITY

Does Your Battery Shop Equipment Produce or Reduce Arguments with Customers? Do You Increase Your Shop Profits by Using the Right Equipment?

THERE is in our neighborhood a small tailor shop operated by a little man, apparently a Russian Jew, whose command of the needle and thread is beyond reproach, but when it comes to the English language, he still has a long way to go. As I passed one night he was in animated and acrobatic conversation with a customer, apparently haggling over the details of some repair that had been made.

As I decided to move on, my eye on the small signs that supplemented the display of garments in his window, and one of these, apparently devised by the proprietor, read, "Altercations A Specialty."

As I glanced at the little man's misdirected attempt at suitable advertising, I was impressed with the fact that the sign would be quite suitable for some of the battery shops I have seen where nearly every repair job terminates in a protracted debate with the customer, with the chances ten to one that he will be made a life-long enemy instead of a satisfied booster. While the little tailor's trouble was natural and perhaps unavoidable, handicapped as he was by lack of education, that of the battery station can, in many cases, be overcome by analyzing the cause of the discussion which usually leaves everyone concerned in an irritated state of mind.

The lack of proper testing equipment, especially a high rate discharge tester which, in a moment, gives both the shop man and the customer an absolute check on the battery's condition is a big factor in causing dissatisfaction and loss of customers and profits.

Two typical shops within half a mile of each other illustrate the wrong and the right way of doing battery work. In one, the customer's word is taken as a basis for putting the battery on charge, and it is accordingly put on the line, regardless of whether it is good, bad or indifferent.

After two or three days the battery shop finds that the battery is not taking the charge, and something is apparently wrong. Then the job tag is referred to and it is found that someone forgot to get the customer's telephone number. When the customer comes in expecting to get his battery he is told that something is wrong with it, and that it will have to be taken apart. Naturally there is some discussion started at once, as the customer feels the battery shop should have known this when the battery was first brought in. The ultimate result is delay, additional expense to the customer who in the meantime is paying for a rental battery at so much per day and in the end a loss of profit and good will to the battery station.

The other battery station has a high rate discharge tester which, on the bench where batteries are received, can put a load on the battery similar to what it would have on the car. This is explained to the customer, who is impressed with this business like arrangement. The battery is then subjected to this test and the condition of each individual cell is shown on the meters where both the shop man and the customer can see what is going on. Then if two cells show a fair reading and one is way low, there is not much basis for the customer to feel that perhaps the shop man is slipping one over on him.

The trouble is explained, the cost is determined, and the job is made definite, so that when the customer comes for his battery, he not only pays willingly, having been given an idea of what he is paying for but gets his service when he expected it instead of a week later.

Which is the best investment, to hang on to the cash that the equipment represents, or have the right equipment and hold the business that comes to your shop? Unless you wish to go out of business, or send much of it away from your doors, the answer is the equipment, every time.

ELECTRICAL TROUBLE SHOOTING

The Equipment Most Needed—Methods That Get Results —How to Follow a Wiring Diagram and Use It on the Job

By A. H. PACKER

YOU guessed it. The carpenter who built this house did not use a level or plumb line.

Do you know why? It was because he was so clever that he did not feel the need of high-brow instruments. A hammer and saw were good enough

for him. Have you ever met an electrician so clever that he felt he did not need to use meters and diagrams? The results of his work may not stare you in the face as this house does, for the customer will drive the remains to some other shop.

IT is not the intention of this article to belittle in any way the good work that is being done by many a self-made mechanic or electrician, but just as the house in question could have been made more symmetrical and perhaps also more serviceable by the use of the proper tools correctly used, so can the electrician with the right instruments, etc., do a better job and not only give better satisfaction to his customers, but do each job in less time and make more money. We appreciate that the self-made man may have accomplished so much in a practical way that he does not know how much better he could work if he would transfer some of his energy from actually doing the work to learning HOW to do it BETTER.

What Does a Wiring Diagram Mean?

To the average man a wiring diagram means about as much as an architectural drawing would mean to the man mixing sand and cement for the construction of the building. In the case of the electrician, however, it is almost imperative that he be able to understand diagrams of this kind, for otherwise he depends on good luck and instinct to find trouble when he should for best results use a systemmatic method of hunting the trouble.

A wiring diagram is a road map, but different from some maps, it always leads us back to the starting point. That is why the wiring is referred to as a circuit, because it comes back to the starting point. Now, all there is to tracing is to start at some point, pretend you are a fly walking along one of the lines and see if you can keep going and get back again. The first difficulty, as in following a road, is that we soon come to a fork in the road and find no sign to tell which fork to follow. While on the road this might lead us astray, it can hardly do so in the wiring diagram, for all roads lead back, or should, if the diagram is correct.

These separate forks usually represent different circuits, as, for example, the horn circuit, the ignition circuits, lighting circuits, etc., each of which bring us back to the starting point.

General Rules for Tracing Circuits

For starter, lights, horn, ignition and all circuits that USE UP the current or DISCHARGE THE BATTERY.

Start at the positive or plus battery terminal and trace, out through one circuit only until arriving back at the other battery terminal, which is the negative or minus terminal.

If the battery is grounded (connected to the frame of the car), trace from the other terminal, no matter whether it is plus or minus, until arriving at the frame of the car or ground.

From these rules we conclude that when tracing the starter circuit we forget all the others temporarily and trace this one only, through the starter switch, the starter itself and back to the battery.

Then when this part is clearly in mind, we trace some other one circuit, letting the others alone, and proceed in this manner until it is clearly in mind just where the current SHOULD go. From this point it is not far to finding whether it really is going there or not.

For the generator circuits, it may be best not to start at the battery, but at the positive generator brush. If one brush is grounded, trace from the other, or insulated one, until arriving at the ground.

In thoroughly tracing all generator circuits, we generally begin with the field winding, tracing from one brush through the different coils and back to the other brush. In third brush generators it may be from one main brush to the third brush.

After tracing the field, trace through the fine winding of the cutout and back.

Then if we assume that the cutout is working and closes its points, trace from the live generator brush out through the contacts in the cutout and through the ammeter to the battery and through the battery back to the generator.

Summary of Trouble Shooting Requirements and Process

1. Ability to trace a diagram one circuit at a time, and get back to the starting point.
2. EQUIPMENT. Charts, wiring diagrams, or manuals that give the circuits of the cars that may come into your shop.
3. Ability to look at the right diagram, pick out the circuit that is causing the trouble, and see what conditions SHOULD exist.
4. Look at the circuits on the car ahd see that for every black line on the diagram there is a wire or cable on the car. This is a case of visual inspection which does not always work, as we can not always see just where the wires go.
5. Where wires can not be seen, check them electrically by means of their ability to carry current.
6. EQUIPMENT. Have the necessary meters to check the circuits where the wires are hidden from view.

WHAT THE FAIRY'S WAND DID TO THE USED CARS

The Fairy, in This Case, Was a Versatile Mechanic Who Had Read MOTOR AGE and Acted on What He Read. He Converted a Liability Into Profit

By JOHN ROOKS (practical garageman) and JAMES V. MALONE (writer)

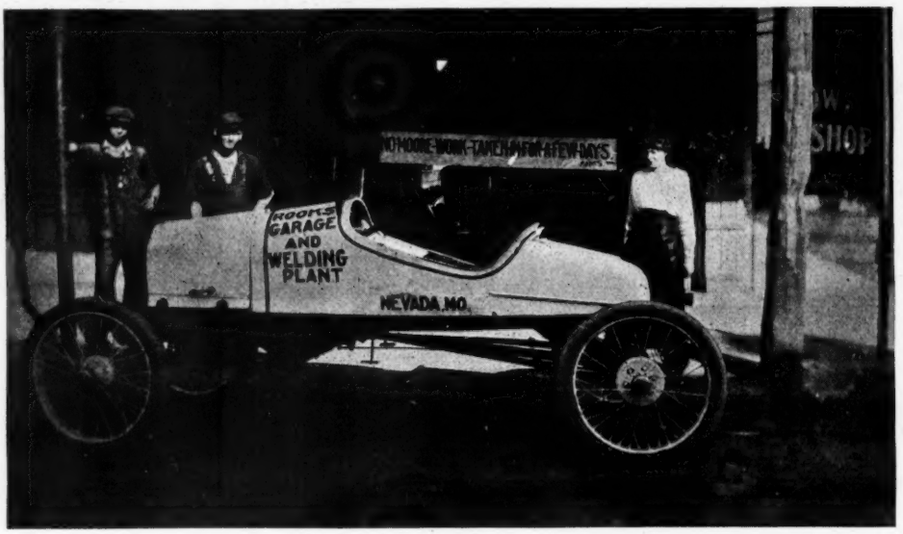
"ONCE upon a time" stories usually have a good moral to them, just as all stories should have, but the kind that give an experience, that is, something that really happened, should teach a lesson. Perhaps this experience of mine will help some other dealer who happens to be in the same predicament that I was in (and I venture to say there are quite a number of them.)

In almost every dealer's establishment, there is a number of dusty shabby ab-used cars, which he took in exchange for a perfectly good new car and which are now, as were mine, "a ghost in the attic."

I had five of them and every day made them look like another year had been added to their lives, just as a year was subtracted from mine. I had invested too much in them to turn them over to the junk man and there's a sort of feeling for something that's been around for a long time, even though it is past all usefulness, that makes it hard to part with it—especially if you're going to lose all round.

I had offered to sell or trade them for anything that my family could eat, drink or wear, but there were no bidders and still they stayed there—five in a row.

One day, however, my "knight of magic power" came. The day found the clouds pouring forth a generous supply of their reserve waters and as I stood looking over my shop, wondering just how soon I should have to lay off the men and take a rest myself, he came.



Rooks built a good many special jobs after the big idea was in working order. This photograph shows one of the simpler jobs. The sign on the window is notable. In a town of 15,000 Rooks had five men at work in a shop 38 x 100, and they were so busy that promises were of no avail and work simply had to be turned away.

He remarked that the roads were very good, all the way, if one had a row boat and in this way, prepared to ask me for a job. His manner struck me as being funny—didn't he see the finished five over there? Wasn't that enough to halt any man? Didn't I look like I had been sentenced to death?

Perhaps my attitude toward my visitor was after the manner of the man who knows he is going to drown and, becoming fatigued, stops to play for a last time with the waves.

At any rate, I talked to him, and, as I had expected:

"You know I'm a stranger in this town," he said, "and from the appearance of your shop, I thought you might give me a few days work."

Here was a first-class, practical joker. "From the looks of my shop, eh?" I repeated, "hurry up, son, tell the rest of it, I'll bet it's good." There was a look of sincerity in his eyes, as:

"I'm in dead earnest, old top," he informed me, "I'm a good mechanic, and you don't have to take my word for it"—he started into his pocket, to draw forth a number of newspaper clippings and letters—"here's what I intend to sell myself on."

I hadn't seen an out-of-town paper in so long that I welcomed the chance for a change of type, and letters of recommendation are always interesting. There were pictures, too, and I always liked photography.

"I'll look them over," I told him, "not because there's a possibility that I might put you to work, but because I have nothing else to do."

"Just as you say," he said, smiling, "if you'd rather look at the wall for a few minutes, I'm sure I can tell you a thing or two."

I started: "Lad, I've been in the automobile game since they first began to scare horses and I know when I need some one to work for me and when I don't. Right now, there's nothing to do and I'll attend to that myself."

"I see you have several used cars around that look mighty dusty —" here was one of them smart chaps who had taken a correspondence course on how to get a job and he thought that all he had to do was to keep on smiling and eventually, he'd get me feeling so good that I'd give him a job.

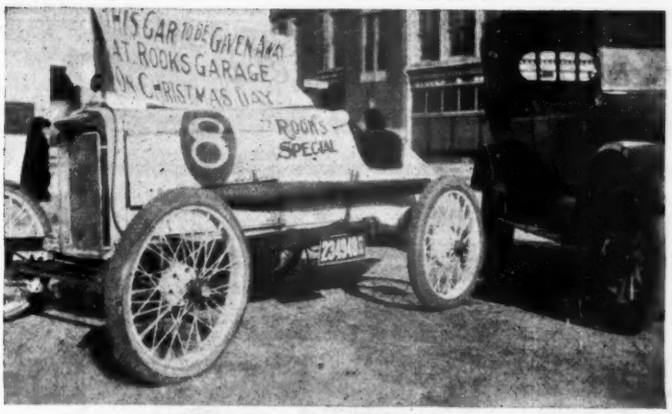
He picked up one of the pictures and slid it under my nose. I saw a work room, well lighted, well equipped and orderly. The next one he showed me was of himself, evidently trying to explain something to the owner of the car they were looking at.

Written across the bottom, in ink, were the words, "It is not the car that needs working on, it's the driver." There was something in this that got something like a laugh out of me. It sure did fit some cases I had known.

There were other pictures and eventually he showed me one of a sport roadster, a nifty looking job, well finished and of good design. I liked it and thought of "what might have been."

While I was still reflecting, he showed me another.

Here I saw another sport job, apparently under construction, and my visitor in overalls working on it. Slowly I began to see the light. He was not a correspondence school



During dull seasons, Rooks stirred up interest with cars of his own design

job-hunter but a body designer. And still I thought of how far away from a job he was.

"How do you like those two?" he asked of me, eyeing them with pride.

"They're dandies," I replied, "Wish I had 'em."

"You have," he told me, "not two of them, but five."

Whenever figures were mentioned and there was a five around anywhere, I could see in my mind's eye, five dusty shabby cars against the wall of my garage.

But slowly it came to me—here was a body designer looking for a job and I had five cars outside, all of which, I remembered, were in good mechanical condition, but the appearance they put up as far as body work was concerned made anything but a sales help. While I was thinking he told me how these designs and his craft had grown out of what he had read in MOTOR AGE.

"Well," I said, when at last I saw a ray of hope, "What'll it cost to put one of these antiques into condition—that is, make it look like the one in this picture?"

"If you'll give me a helper until I take off the body from one of those cars and oil up the chassis and give it a few touches, I'll turn the job out, ready to drive away for $75, and you can pay me when the bus is sold. Is that fair enough?"

I thought so and he went to work right away. A day or so, and that roadster looked like a million dollars to me and to some of my townsmen, too, for they began gathering around and watching my friend as he worked.

When that first roadster had the upholstery and paint on it, I had $318 hung up on the bank book, in the "deposit" column and an order placed with my body designer for another $75 job.

The five has dwindled down now to one dusty, shabby, ab-used car as I write this and my friend is at work on that now. The others all made a loud gong come from the cash register and I'm all set now for a number of such gongs and I'm all ready to take on as many used cars as I can handle—just so long as the power plant is in good shape, I'll have a good body job for it in a short time.

Every time I think of the five cars, now, I think of "once upon a time" and laugh.

Of course, the actual work of transforming a used car into a new one is something that needs a thorough explanation and I shall endeavor to tell how my body man and I accomplished this in our own shop.

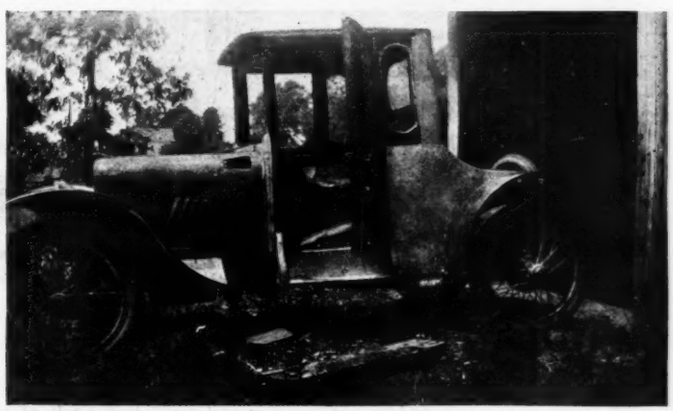
I find that it is most important to at all times have a high radiator. This can be done by either building it higher, blocking under it to raise it, or both.

Next, it is important to have the cowl, dash, and radiator on a line at the sides. Third, the rear of the seat should be at the correct angle for the sitting position, that is, if the position is low, tilt the seats back accordingly so that it will be a case of comfort for the driver.

Bodies built in our shop are modelled after designs appearing in MOTOR AGE. Many helpful suggestions covering every phase of the work were obtained in the pages of that publication.

Twenty gage sheet metal for the dash and 24 gage sheet metal for the body is about the most adaptable to the work and it will cost near $20 for each job.

In the body work, we have the following special tools: two pair of large tin snips, one pair of straight and one pair of curved; one babbit hammer weighing two pounds, one rivet set,



A coach in the making. A special order job for the Rooks Garage

one sharp punch, one soldering outfit and one welding plant. These tools together with the ordinary garage equipment is all that is necessary to turn out a special body job, exclusive, of course, of the paint and upholstery. We always use old leather if we can get it because it is much better and easier to transfer.

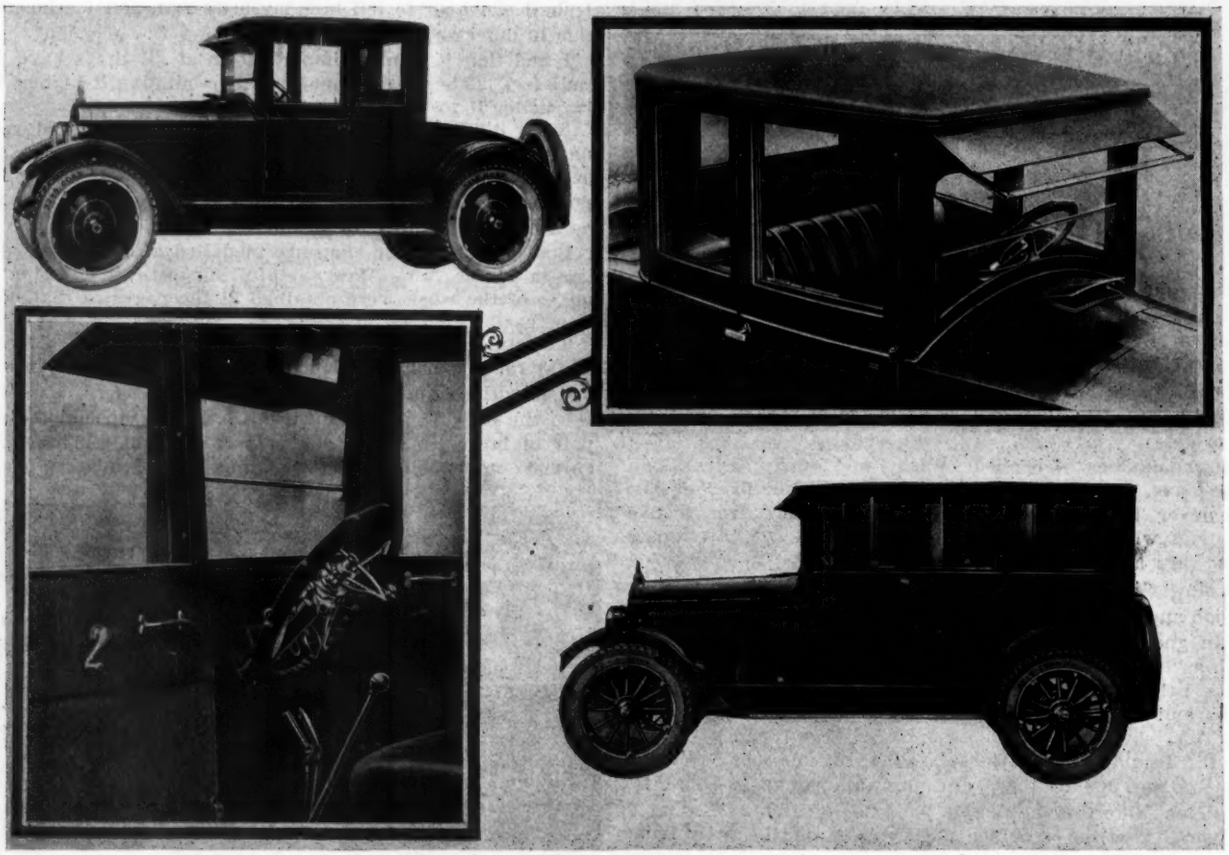
In preparing the paint room, we have taken a composition partitioning board and sectioned off a corner of the shop that is airy and bright. The corner thus prepared is practically dust-proof. Paint jobs were turned out after consulting the paint articles appearing in MOTOR AGE last year.

The Spiral Worm Drive

(For tourist business.)

A cry rings out through all the land,
The fishing season is at hand,
Dig up your tackle and your hooks,
The winter's gone, the summer's long,
We're off for lakes and running brooks,
The tourists start, a million strong.
The local camp, the wise ones see,
The dealer's opportunity,
As limping in on one or two
They need a set of spark plugs new,
The fighting dealer, never blue,
Has put it through in '22.

New Offerings in the Car and Truck Field



The upper illustrations show the Gardner business coupe with full coupe body. It is equipped with permanent visor, rain-proof windshield and cowl ventilator. Just back of the seat is a compartment for parcels, tools or tubes. The tilting steering wheel, rotary type window lifts and spoon type brake release are incorporated in both models. The sedan is at the lower right

Gardner Adds a Business Coupe and Five-Passenger Sedan

TWO new models, a business coupe and five-passenger sedan, have been added to the Gardner line. The chassis and mechanical features of these cars are the same as for the open models. The business coupe is especially fitted for business use and being a full coupe body has several advantages over the ordinary combination of coupe top and roadster body.

The seat is upholstered in straight-grain leather, and just back of it is a convenient compartment which affords ample carrying space. The door windows are raised and lowered with automatic rotary-type noiseless lifters.

The coupe has a roof construction which consists of cross bows covered with fine-mesh wire screen and heavy duck, padded to give a smooth appearance and to prevent sagging. The car has an 18-in. steering wheel with non-slip, hard rubber rim and aluminum spider.

The coupe has a cowl ventilator, permanent sun visor and rain-proof windshield. The lower glass of the windshield is in a fixed position and has a rubber weather strip across the top edge. The upper pane, overlapping the lower glass, comes in contact with this rubber strip so that the hardest driving rain cannot force its way into the inside of the car, it is stated.

The sedan, with 19 coats of paint on the body, is finished in blue with black enameled fenders and nickel-plated, satin-finish hardware inside the body.

It is upholstered with heavy, 20-oz. all-wool body cloth supported by curled hair padding in the cushions and backs, and deep spiral springs.

The rain-proof windshield and permanent sun visor are features of the sedan. A forward-tilting cowl ventilator is fitted. The windows are fitted with silk shades mounted on spring rollers. A heater provides ample comfort for winter driving. The roof of the body is of the silent type.

The four-door design provides easy entrance to both front and rear seats. By turning a small button on the inside before leaving the car, the doors are locked. The right front door is locked from the outside with a Yale key.

Both the sedan and business coupe are equipped with drum-type head lamps finished in black enamel with nickel-plated rim and non-glare lenses and nitrogen bulbs. They are set high to lessen the road shadows and are supported on heavy pressed steel brackets, bolted to the front fender irons, and held rigidly in place by a heavy cross tie rod.

Deluxe Velvet Clutch Control

The Deluxe Velvet Clutch Control is a device which reduces the tension on the clutch throwout mechanism whereby there is obtained a leverage of 8 to 1. This makes it possible to throw out the clutch with only a slight pressure on the pedal, the makers claiming that the pressure of one finger is sufficient to operate it. The easy action is obtained by compound leverage. The device which is made primarily for Chevrolet cars, can be installed in 10 min., it is stated, and

does not require the drilling of holes. The makers state that the device will overcome all tendency of the clutch to jerk, seize or take hold prematurely. It is made by the Clark-Turner Piston Co., Los Angeles, Cal., and sells for $6.50.

Federal Fast Express, New One Ton Model

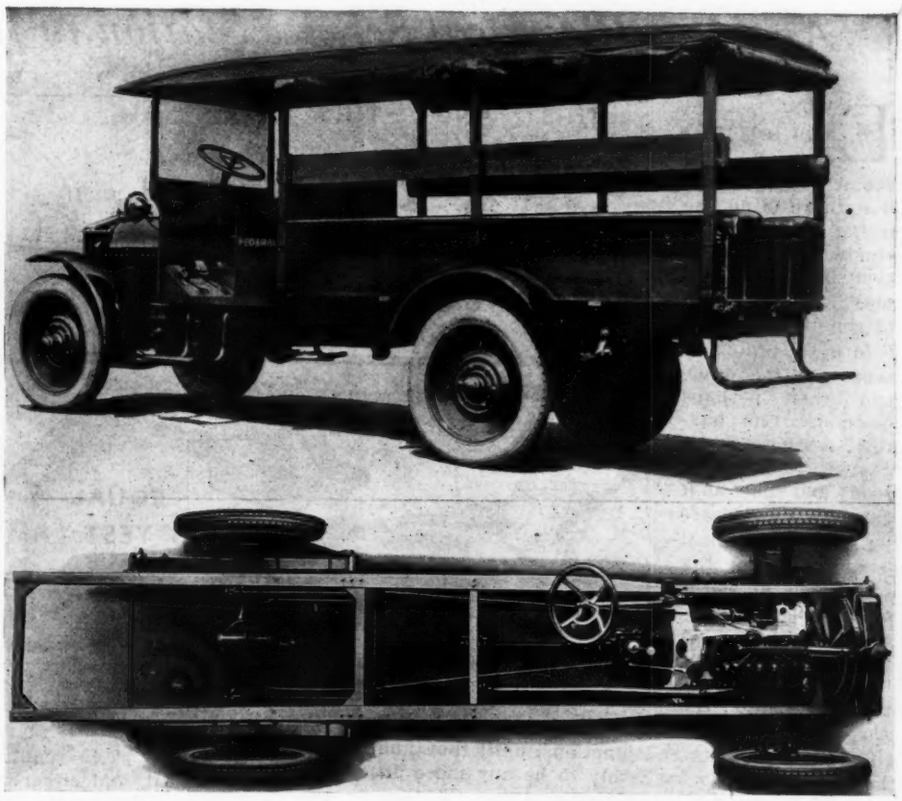
A NEW model, known as the Federal Fast Express, with a nominal capacity of 1-ton, has been brought out by the Federal Motor Truck Co. This new delivery type truck has a chassis weight of 2950 lb., with a body allowance of 900 lb. It is mounted on a 132 in. wheelbase chassis with 56 in. tread and has a loading space back of the seat of 110 in.

The powerplant is the Continental J-4 engine, which is the same unit as has been used for the past 2 yr. in the Federal model 3-D. This engine has a bore of 2¾ in. with a 5 in. stroke. It has a three-bearing crankshaft with 2½ in. diameter shaft. It also has a heavy camshaft 1¾ in. in diameter mounted on three bearings. The truck is distinctive in that, although of small capacity, it is worm drive, employing the Timken units. The worm drive type of rear axle is used in all Federal models. In addition to the Continental and Timken units, the Federal Fast Express employs the Eisemann magneto, Zenith carbureter, Oakes fan, Long radiator with the core in a heavy pressed steel shell, Borg & Beck clutch, Detroit Gear and Machine transmission, Peters universal joint, Gemmer steering gear, Stewart-Warner vacuum tank, Disteel wheels, U. S. Royal cord tires, Alemite chassis lubrication, Remy starter and generator and Exide heavy truck service type of battery.

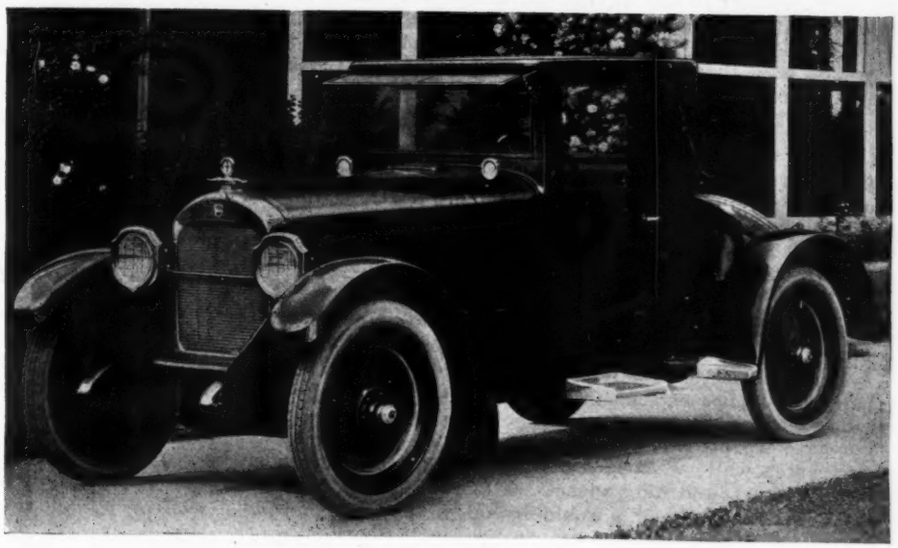
The clutch is a 10 in. type. The gearset is a sliding selective type and in conjunction with the 5.6 to 1 reduction in the rear axle, gives a final reduction of respectively, 5.6 to 1 on high, 9.4 to 1 on second, 17.4 to 1 on low and 21 to 1 on reverse.

The Federal company has made arrangements to furnish any style body mounted and painted ready for work. There are in all thirty-two different combinations of seats, bodies, windshields and cabs which have been worked out to fill practically every need of express or delivery work for which this chassis would be called upon. Many of the combinations are interchangeable on the same body and with the same top.

Production on these models started July 5 and it is expected that by Aug. 1 demonstrators will be in the hands of all Federal distributors. Owing to the magneto ignition equipment and the adaptability of the truck for various road conditions, it is expected that considerable export business may be secured with it. In fact, orders have already been received from foreign countries, and this end of the merchandising of the truck is going to be a part of the selling program. The price of the chassis is $1375 f.o.b. Detroit.



Top—Three-quarter rear view of new Federal truck. Body is Long. It has canopy top and longitudinal spring upholstered seats
Bottom—Chassis plan view showing location of motor, rear axle transmission, propellor shaft, universal joints



New coupe of roadster type put out by Liberty for business and professional use

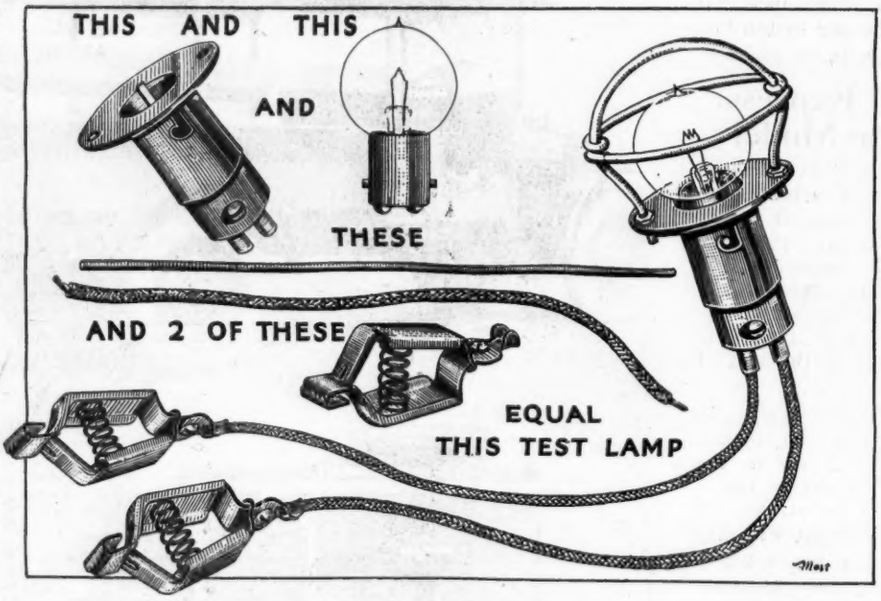
New Liberty Coupe

A new coupe of the roadster type, designed particularly for business and professional men, is being manufactured by the Liberty Motor Car Co. The body is a distinctly two-passenger design, the seating arrangement being side by side. The lines of the under part of the body are identical with the Liberty roadster and the upper part is a substantially constructed steel covered unit, which provides exceptional rigidity for this type of body.

There are two doors, the door width being 22 in. and the height 45½ in. The door pillars are of wood covered with steel. One of the features of the body is the large glass rear light.

The body is fitted with a step instead of a running board and there is an aluminum casting at the base of the rear fender which carries out the step idea and, at the same time, provides a rigid support for the rear fender. The top is soft over wood framing and in the construction throughout, the design has been arranged so as to eliminate any drum-

An Ideal Electrical Service Station in the Making—No. 1



EVEN those who have never done any rabbit hunting know that there is no use trying to chase the elusive animal wherever it goes, for it may go in one end of a hollow log, and before you know it, scoot out the other end, then perhaps down into its burrow. The only chance is to be ready and shoot as it comes up or passes by. In electrical trouble shooting the same general methods work out best, and the repair man who tries to follow the circuits under the car, into the grease, through the lume, behind the cowl board, and through all the many twists and junctions, until they finally appear in the light of day is not likely to be any more successful than the rabbit hunter without a gun.

It will be found that every piece of wire has two ends, and if at one end the circuit seems to lose itself in the depths of the chassis, it is only necessary to find the other end, and let the intermediate part take care of itself. The difficulty, without any sort of test equipment, lies in the fact that it is hard to tell which wire is the end of the one we are hunting for, but with a test lamp, there are a hundred and one tests, more or less, than can be made and which take the guess work out of electrical repairs.

Will Pay for Itself

Starter trouble, ignition trouble, or open circuits in lamp lines or generator circuits can be located quickly by the test lamp whereas hours might be spent finding a poorly soldered terminal where the poor connection was taped up and seemed to be all right. Moreover on a small investment costing a dollar or so many dollars can be made.

The saving of time alone on a repair job will pay for this equipment, the first day it is used. The customer that sees a systematic test used will also get the impression that the repair man knows his business, and will be more easily sold on the fact that the electrician's time is worth more per hour. Then have we not all had the experience of having the customer watch while we looked at this and that, not sure what to look at next, and only wished we knew some real way to test so that the guessing would be taken out of the work. There may have been a day long, ago when you might have fooled the customer into thinking that taking the hub caps off and on would improve the ignition, but those times are no more, and the customer is now an intelligent business man well versed in mechanical things, and must be shown. Why not start with this simple piece of equipment, so that on the next job you can show that you know your business, and have the right to consider yourself a specialist.

The Necessary Sorts

The parts required are either on hand or are easily obtained, and either a six or twelve volt bulb may be inserted depending on the voltage of the system being checked.

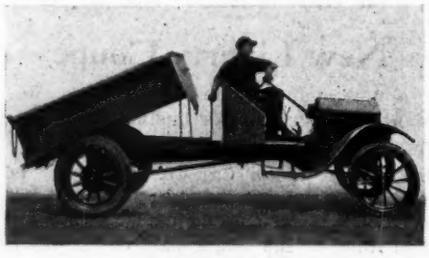
The method of using a device of this kind has been described thoroughly many times in MOTOR AGE electrical articles. Its chief value is in locating open circuits, which prevent the starter or ignition or lights from working and, as the battery is the source of the electrical current in such cases, the first test is usually made at the battery. The next thing to do is to trace along the wiring to the next connection in the starter or ignition or light circuit depending on the nature of the trouble and again make a test. In grounded systems the test is made from each junction point, terminal or connection, to the frame of the car, the lighting of the lamp showing that the circuit is not broken up to that point. The general rule for the location of the break is that it is in between the last place where the lamp would light up and the first place where it fails to do so.

Testing the Generator

Another place where the lamp can be used is at the generator, to see if it is building up voltage. In this case however, it is well to use a 12 volt bulb for a 6 volt system, and also keep the speed of the engine within reasonable limits, as the generator if not connected to the battery may generate 30 or 40 volts at high speed. This voltage would burn out even a 12 volt bulb so that it is easy to see that care should be used when checking the generator, although no such precaution is required when testing out the battery circuits.

(*Continued from preceding page*)
ming tendency. The windshield is a one-piece type and the car is provided with a cowl ventilator. Tuarc wheels are standard equipment with nickel trimmed head and parking lights. The car is equipped with a water indicator and special radiator filling cap. The windshield is equipped with a visor.

The doors are provided with Eagle locks, with an inside door lock on the left door and an outside door lock on the right. In addition to the usual dash equipment, there is also a clock and cigar lighter.



Jiffy Dump Body

The Griscom-Russell Co., 90 West Street, New York, has placed on the market a new dump body for Ford one ton trucks. A feature is the scale balance support. There is no hoist and the body dumps automatically upon releasing of the locking device. The driver can operate the Jiffy dump body from the seat without stopping the truck. The dumping operation is as follows:—Driver releases locking device and body automatically tilts until it reaches the 45 deg. angle, at which time the tail gate automatically opens and the load dumps. This tail gate can be arranged to spread material to any desired thickness on the road. The gate is of the double acting design, permitting change to express body.

GEE! DON'T YOU FEEL CHESTY

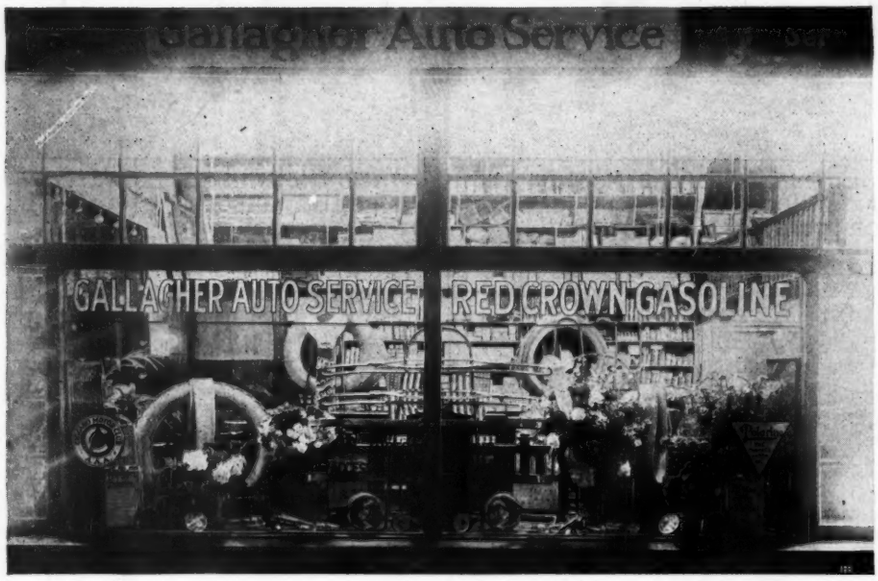
WHEN YOU GET UP LATE WITH A BAD TASTE IN YOUR MOUTH ON A HOT MONDAY MORNING AND
HAVE TO RUSH OFF WITHOUT YOUR BREAKFAST AND
WORK ALL MORNING ON A BACK-BREAKING JOB OF PISTON LAPPING, THE SWEAT OOZING FROM EVERY PORE.
IT HELPS SOME TO GET A GOOD SUBSTANTIAL LUNCH
BUT IF YOU SPEND MOST OF THE AFTERNOON UNDER SOME GREASE-DRIPPING RATTLETRAP AND
WHEN THE WHISTLE BLOWS, COME OUT FEELING LIKE A PIECE OF PICKLED TRIPE.
PERHAPS - IF THE BOSS HAS MADE PROVISIONS,
YOU CAN HAVE A GOOD HOT SHOWER AND BRING BACK YOUR PEP WITH A LONG DASH OF COLD, AND
SAY BOY! THIS WILL LAST ALL DAY TOMORROW- MAKES ME FEEL LIKE A FIGHTIN' SON-OF-A-GUN
WHEN YOU GET ALL PEPPED UP AND CLEANED UP, THEN, IF YOUR GIRL PHONES AND ASKS YOU UP TO SUPPER
GEE !! DON'T YOU FEEL CHESTY?
WOW!
WILDER

If the boss puts a little chocolate frosting on the day's work, the boys will do a little more tomorrow.

The VALUE *of* SHOW WINDOW APPEAL

The Sales Miracle That Was Brought About As a Result of a Well Arranged and Brilliantly Lighted Window and the Incident That Showed Its Cash Value

By FRANK BALLARD



This show window brilliantly lighted was the only public appeal for a new store that averaged $350 daily sales

When the bill board under way in this picture was completed it blocked the window display and sales dropped to an average of $9 daily

WE often hear the story of successful businesses after they are considered well established and permanently successful—that is, permanent as success goes. But this story differs a bit; it is a story of success in the making with a specific experience that can be generally applied.

Gallagher—he's the mainspring of the Gallagher Auto Service, Chicago—always dreamed of getting into the automobile business. He's in it now, has been for six years, and is intelligently planning his way. His ups and downs in those six years, starting with a small back alley repairshop and building up to his present large maintenance business employing 25 people and two wrecking trucks make a story in themselves, but the real romance lies in his entrance into the accessory and supplies business when the "Miracle of Display" turned a shower of gold upon him.

But first we must describe the out-of-the-ordinary circumstances surrounding his case. They are a little different from the experiences confronting the average man selling accessories, but they serve all the more to emphasize the "Miracle of Display" which can be utilized by any other dealer as his Alladin's lamp; so read closely.

The Opportunity

Gallagher had a number of small buildings grouped on a side street a few doors off Michigan boulevard, the busiest motor thoroughfare west of New York. Recently the city fathers decided to widen this great motor lane by chopping off a few buildings from one side of the street. Gallagher, one morning, found one of his almost windowless old brick buildings with its sidewall acting as frontage to endless processions of automobiles and people. He saw the opportunity—accessory sales and supplies would be just the thing. The park

district stretches to his north and not another automobile supply house is within three blocks to his south.

He lost no time in putting a large display window in that ugly blank wall and dressing it with taste and appeal. His opening night was a gala affair with flowers and favors for the occasion.

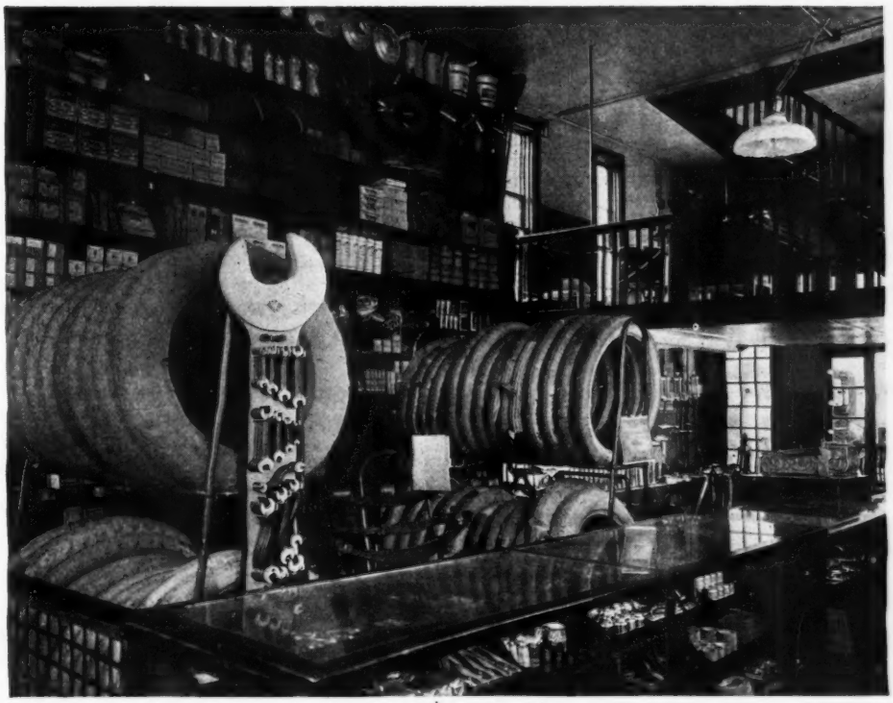
And then business started. He stayed open until 12 at night and his brilliantly lighted store stood out against the somber background as an oasis to the troubled motorist. Gallagher was swept off his feet by the influx of business. The "Miracle of Display" had got into action. His cash register told the story of sales to the tune of $325 to $400 a day. If fifteen days of such display brought in new business like this, what would it be months later when the cumulative effect on car owners passing each morning and night firmly established the store in their minds?

An Unfortunate Happening

If what happened so far convinced Gallagher of the wonders wrought by display, that which happened later etched it still deeper on his consciousness.

In widening the boulevard a strip of property five feet wide and extending the frontage of the building had been left between his property and the street. There is some tangled litigation concerning it and unfortunately for Gallagher an advertising company erected a signboard on it, completely hiding his store. The signboard in the process of erection is shown in the picture.

Gallagher now realizes what that window meant to his sales — THEY DROPPED FROM AROUND $350 A DAY TO $9.



The show window was backed up by this neat stock and clerical courtesy to match it

At this writing Gallagher and the jobber who sells him his merchandise are studying law and hiring lawyers to get the billboard removed.

—:—

The story now changes from Gallagher's troubles to point a lesson.

There are other men in this business who might as well have a signboard in front of their display windows for all the benefit they derive from them. They do not realize it because the growth and dropping off of their business has not been as marked and accounted for as in Gallagher's case.

Study your display windows and their possibilities to work the miracle. Don't let the signboard of indifference and disorder block the path to your door.

A scientist has stated that 82 per cent of the impressions which influence the action of people are received through the eye. What better application of the "Ask 'Em to Buy" psychology could there be?

Standard Eight Lubricating System Shows Oil Economy

AN example of late and approved practice is shown in the lubrication system of the new Standard Eight. The illustration outlines the circuit of the oil in this system. It will be seen that this is a full force feed using a dry sump with scavenger pump. The path of the oil is as follows: leaving the oil supply tank which is installed on the right frame rail, the lubricant flows through the lower feed pipe to the pressure circulating pump. The pressure or discharge side of this pump is connected to a distributor pipe which is provided with a "T." One branch of the "T" leads the oil to the camshaft bearings while the other lead has branches to the main bearing housing from which the oil enters the hollow crankshaft to lubricate the connecting rod big ends. The oil which escapes from the connecting rod and camshaft bearings serves to lubricate the pistons and piston pins. The excess drains off to the crankcase but does not remain there as it is then conducted to the intake side of the return or scavenging pump for cooling and recirculation. The discharge side of the scavenging pump is connected to the upper pipe of the oil supply tank. The end of this pipe discharges the returned oil into a screen where it is cleaned of foreign matter before being recirculated. This system provides a dry sump at all times regardless of the angle at which the engine is operating. Great economy is claimed for the system which on a test run from Pittsburgh to New York consumed less than a quart of oil. Thermometer readings taken of the oil after the ascent of several of the high Allegheny ridges showed no appreciable increase in the temperature of the lubricant.

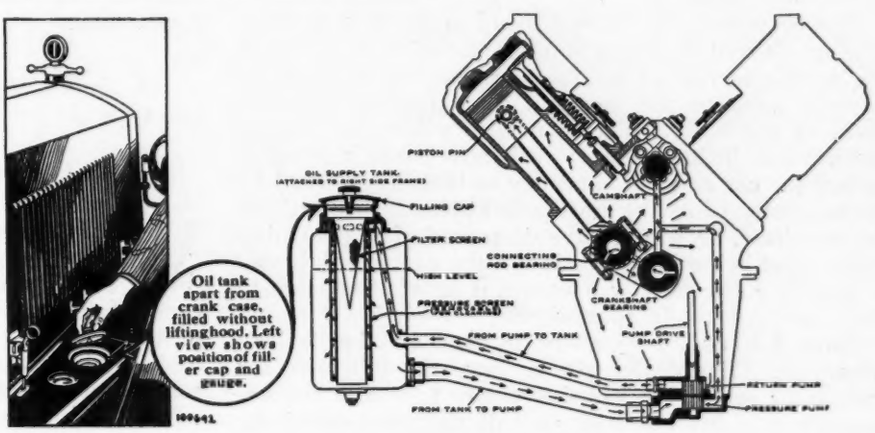

Oil tank apart from crank case, filled without lifting hood. Left view shows position of filler cap and gauge.
PISTON PIN
OIL SUPPLY TANK (ATTACHED TO RIGHT SIDE FRAME)
FILLING CAP
CAMSHAFT
FILTER SCREEN
CONNECTING ROD BEARING
HIGH LEVEL
CRANKSHAFT BEARING
PUMP DRIVE SHAFT
FROM PUMP TO TANK
FROM TANK TO PUMP
RETURN PUMP
PRESSURE PUMP

Diagram of oiling system on Standard 8

MOTOR AGE

Reg. U. S. Pat. Off.
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Using Your Customer's Credit

THE development of a sound and convenient time payment plan in automobile distribution has greatly enlarged the sales possibilities without in the least increasing the dealer's risk. In fact, this system, which is used in from 50 to 75 per cent of all retail sales, is an added factor of safety because it makes it unnecessary for any dealer ever to become the creditor of his customers.

The customer who is worthy of credit may have it. The specialized financing house is the third party standing at the service of both dealer and buyer, ready to advance cash to the one and to accept the monthly notes of the other. The man with a fair and regular income but little available cash now finds it possible to buy the car he wants and pay as he rides. Faced by the necessity of saving up the full price before making the purchase, he would have despaired of ever owning a car. But being in possession of the car and obligated to pay for it, he usually manages it in what appears to him a comparatively short time.

Thus the customer's credit is used for the dealer's advantage. The dealer gets at once the full price for the car he sells. He has the money to use in the enlargement of his business and all the expense of the transaction is borne by the purchaser, whose total obligation to the finance company naturally is somewhat more than the amount of cash advanced to the dealer.

Under these circumstances it is plainly the duty of the dealer to protect the customer so far as possible against exorbitant charges and sharp practices in connection with the credit transaction. The dealer should familiarize himself with the finance companies in his territory and make it a point to send his customers only to those which he knows to be reasonable and fair in their charges and honest in their methods. In most industries the sound and upright institutions usually are found within the fold of the recognized business associations in their respective fields. The finance companies have such a national association and a number of local associations.

The credit is your customer's, so treat it with the respect it merits lest it cease to exist.

By the way, was there an instruction book in that last car you delivered?

Plenty of Speakers

AN indication of a service that a State Association can render to local associations is illustrated in a recent bulletin issued from the headquarters of the Illinois Automotive Trade Association, which names speakers on automotive subjects available for local occasions.

This list contains the names of 28 men who have been successful in some line of the automotive business who are willing to visit any community in the state and give to the dealers in that community the benefit of their experience. There is one open road to learning more about business and that is to study. Our great universities long ago demonstrated that the most impressive way of interesting students in their work was by the lecture or word of mouth process.

This list of the Illinois Automotive Trade Association opens the way for any local group of dealers to plan for their members an "Automotive University Course" in making money in the automotive dealer field. All of these men offered as speakers have been successful and in their talks to other dealers they will reveal many of the little things that have helped them to success. Any dealer should be a better dealer for having sat through such a course of such lectures.

It is to be hoped that the local Illinois Associations will take advantage of the generous offer placed before them during the coming season and that other state associations will follow the educative plan of the Illinois Association.

Tell the maintenance customer of the troubles before, not after the job is done.

A Safety Suggestion

WITHIN the last few weeks there has been a recurrence of safety movements and some intelligent development in the move toward a study of the cause of automotive vehicle accidents. The manufacturers of vehicles and the insurance companies are taking the lead in this new effort and there is every indication that some results that can be applied to traffic regulations will be the outcome.

In the meantime there is no reason why dealers should

not be active in safety work on behalf of their friends who buy cars from them. This work can be accomplished in two ways: FIRST, by talking earnestly with each buyer of a car on the necessity of careful driving and of studying the traffic rules of the home community and communities which this driver will likely frequent; SECOND, by taking an active part in having the traffic rules of the home community changed for safety.

This latter movement includes erecting the proper signs at danger points. A Chicago suburban community recently erected several signs on danger corners which read, "Don't kill a child." Such a sign is a sharp lesson to the careless driver. In other cities signs are erected at the point where serious accidents took place. All of these things are helpful.

S. M. Felton, president of the Chicago Great Western Railroad Co., recently said in a public address in Chicago that during 1921 eight automobiles were struck by trains daily. He said that 20 per cent of these accidents were due to drivers running into trains and that an investigation had shown that eight out of ten motor vehicle drivers crossed railroad tracks without looking either way.

Such carelessness is unbelievable and it must be stopped. The dealer who will be fair to his customers and friends must take the lead in warning them of this situation. Every local dealers' association should have a safety committee ready at all times to co-operate with local traffic officials and with national movements looking to safety of motor vehicle drivers.

"Sell Right and Avoid Comebacks," is a large sign prominently placed in the salesroom of a successful dealer in Chicago. It serves to curb the over-enthusiastic salesman in extravagant promises. In the customer it kindles confidence.

If the Coat Fits

ONE of our readers who chanced to meet a member of the MOTOR AGE editorial staff remarked: "You fellows seem to be getting kind of personal in your articles. From some things I have read recently, I figure you must have been spying around our station."

"Well," was the laughing reply, "if the coat fits, wear it. You can probably get some good from that article or you wouldn't have recognized the description it contained."

We feel that it is recognized that the efforts of MOTOR AGE are not intended as criticisms of the efforts of shop managers and owners, but are for the purpose of throwing the limelight on any methods which are beating the wind, so to speak, and do not bring results.

We are all of one mind: to work for the best interests of the industry, whereby we automatically benefit ourselves, as well as others.

Undesirable Customers

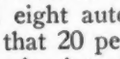
AT a recent automotive gathering the subject of 24-hour maintenance service was under discussion. One speaker commanded a good deal of attention by saying that his company had tried the 24-hour experiment, but had discontinued it, and he thought it would not be repeated. His reason was surprising and interesting:

"Our experience," he said, "was that the third shift customer was not desirable. We are now working on two shifts, closing at 1 a. m., and this is as much as we care to do."

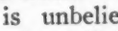
This brings up an interesting question. The maintenance man quoted was speaking for a car dealer who believes that the best way to sell a car is through service. The view presented can only mean that the driver who breaks down after 1 a. m. is undesirable as a car owner. Not many dealers have given much thought to the undesirable customer, although many have tried very hard to sell the more desirable prospects.

Very little reflection will convince any dealer that a car, like a person, can get a bad name in a community by ill-chosen associations. Newspaper automobile editors tell some amusing stories of dealers who were busy a part of the time trying to keep the names of their cars out of unhappy incidents and busy the rest of the time trying to get the car mentioned in better connections.

If you make some sales for prestige, why not avoid others for the same reason?



Salesroom tags showing only "F. O. B. Factory" price savor of sharp advertising practice. The customer wants to know what the car will cost him, Then and There.



The Pants Pocket Bank

A BATTERY service station proprietor was prevailed upon to try an assortment of lamp bulbs with which a window display was provided. The salesman called later and was told that they did not make much on the lamps and that it seemed to be a poor investment. Astonished, the salesman persuaded the shop manager to help him take a quick inventory, which showed that enough lamps had been sold to practically pay for the whole assortment, as the discount was rather liberal. The question then arose as to where the money had gone, and from the way the shop was handled it was quite evident that the pants pocket bank had absorbed it a little at a time, so that the income from this source had not been appreciated.

The salesman explained to the manager, showing him that he was really making good money on the investment and urged him to buy more bulbs to fill out the line. Still under the mental impression that there was not much in it, the purchase of the bulbs was deferred. About a month later the salesman found that there really was a slump in the lamp business. "'Tain't any use," said one of the men in the shop, "You can't sell those things. Seems like they always want some kind you don't have."

Unreasonable customers, surely, to insist on a 32 candlepower bulb for the spotlight when the shop has nothing but 2 candlepower bulbs of the wrong voltage, even so unreasonable as to go next time to some other shop not only for their bulbs but for other requirements.

PUZZLE—What was wrong with this lamp business?

The "Yessir" Salesman

A MAN came into the MOTOR AGE office who had been shopping for a car. He was asked why he had not bought a car that he previously intended to buy.

"Because the salesman I met there was a 'yessir' man," he said.

The rest of the thought is easy. This prospect does not know much about automobiles and admits it in private. He talks rather learnedly in public. The salesman he met agreed with everything he said and he concluded that the salesman knew no more about automobiles than he did, so he could not trust him.

The suggestion is not to agree, unless you know the other man is right and then prove to him that he is right.

F. Nazzaro Wins Grand Prix Race

Drives Fiat 499 Miles At Speed of 79.3 Miles an Hour

122 Cubic Inch Cars Demonstrate Capacity for Greater Speed Than Larger Ones Showed Last Year

STRASBOURG, France, July 15—The two-Litre cars, 122 cu. in., demonstrated in Grand Prix race today that they can give higher speeds than 3-litre, 180 cu. in. ones did last year.

Feliz Nazzaro, race driver known in America 12 years ago, won, driving his Fiat 499 miles at 79.3 m. p. h.

Time was 6:17.17. Last year Jimmy Murphy in his Duesenberg three-litre, averaged 78.1 m. p. h. for 322 miles. This year's race was over a triangular course 8.3 miles per lap and 60 laps were covered. Cars started in one group, three abreast across roadway, as at Indianapolis. This was the first time such a start was ever used in a road race.

It was a veritable Italian field day, two Bugatti cars finishing second and third, with another Bugatti running when the race was called off. Of 18 starters, three finished 60 laps. Time of the Bugattis were: Bugatti, Viscaya, 7:15.09; Buggati, Marco, 7:48.04.

No French or English cars finished. All three Ballots retired, as did British Sunbeams.

Perhaps the greatest feature of the race was that there was not a single tire blowout from start to finish.

While there were no tire troubles there was a landslide of mechanical troubles, indicating that the engineers of 122 cu. in. cars have still a deal of refining to do before they become seasoned products. The mechanical troubles were broken crankshafts, connecting rods, pistons, and valve stems. There were some cases of broken magneto drive and one of a wheel coming off. When it is remembered that the engines in some cars had a crankshaft speed of 5,000 r. p. m. and higher, it is not surprising that mechanical troubles developed. This was the first Grand Prix race in which the rules restricted entries to two litres. Last year one two-litre car completed and finished third.

The race was run on a course slippery after heavy rains, which dried considerably because of strong wind which blew during the race. It was necessary to take turns with caution. Four wheel brakes were used on most cars.

The race was a waterloo for many classic drivers of Europe whose names will remain closely associated with early racing in Europe and America. One to drop out was Goux in a Ballot who ran through a fence but was not hurt and claimed to have been forced off by Nazzaro, the winner. Wagner went out with broken connecting rod. Hemery was eliminated by his car catching fire. Chassange, familiar in Indianapolis races, broke a valve stem in Sunbeam and the same fate befell his running mate Guinness. Guyot was eliminated with broken crankshaft.

One fatal accident occurred. Biagio Nazzaro, nephew of Feliz Narrazo, the winner, was killed when his Fiat overturned in the fifty-third lap, when in third position. His mechanic was seriously injured.

The Fiat team dominated the field throughout the race. Except for a brief period of five minutes when Frederick Bugatti took the lead. Fiats ran one, two, and three for most of race and two laps from finish were holding second place as well as leading. Bordino lost a rear wheel after having held all lap records during the race. His withdrawal and Biagio Nazzaro's accident happening within a few minutes of each other lost second and third places for Fiat when they were leading the nearest Buggatti by nearly an hour.

The two British Aston Martin cars, 1½-litre capacity, made good showing during first half of race, holding their position with all cars except Fiats, but were eliminated at 300 miles because of magneto trouble.

Description of Winning Car

The Fiat which won is built much along the same lines as the larger models. The six cylinders are of steel with welded on jackets. The engine has a bore and stroke of 2.56 and 3.94 in. respectively. The valves, two per cylinder, are operated by two overhead camshafts, with a very light follower between cam and valve. Ignition is by magneto, with a single spark plug in the cylinder head. Pressure lubrication is used, with a dry sump. The carbureter is a Fiat.

One of the interesting things about this engine is the use of roller bearings throughout, excepting for the wrist pins. There are eight bearings on the crankshaft. The engines have been run for several consecutive hours under full load at 5,000 r. p. m. and develops better than 90 h. p.

The engine and gearbox are in unit, with direct attachment of the aluminum crankcase to the frame. The clutch is of the disk type, and the gearbox has four speeds. Instead of the open propeller shaft, double universal joints and Hotchkiss drive of last year's cars, the stock Fiat type of combined axle and propeller shaft housing is used. This is formed of two stampings in the form of a T welded, and has to take care of both drive and torque. Springs are semi-elliptic, front and rear. Four wheel brakes are fitted. The car has a wheelbase of 98 in. and a track of only 47 in. The total weight, empty, is 1,455 lbs.

Voisin Knight Type Wins 444 Mile Gasoline Test

Some Cars Run Out of Fuel and Race Proves Victory for Knight

A fuel economy race was run over the same course as the Grand Prix as a second day diversion. This race was based on a limited amount of fuel and was for 444 miles.

STRASBOURG, France, July 16—Today's race for four passenger stock touring cars in which each was given a definite quantity of fuel to cover 444 miles, was a great victory for the Knight sleeve valve type engine, this engine winning three of the first positions. It was won by Rugier, driving a Voisin Knight type.

The race was an easy victory for the Voisin covering the distance in 6:35:09, or 67.4 m. p. h. The nearest competitor was Durai, in another Voisin, 2 minutes behind, his time being 6:37.31. The Peugeot driven by Bellot is a sleeve valve type.

In this race the cars were permitted a quantity of gasoline, less deductions for oil and grease, to make the 444 miles with a consumption of 13.7 miles per gallon. Cars were equipped with four-passenger bodies, although not of stock design. Only the driver was permitted in the car, the rest of the passenger weight being ballast equal to 154 pounds for each passenger.

Some cars ran out of fuel before finish, three Bignan poppet-valve cars abandoned the race. The winner used Solex carbureter. Finishers were:

Car	Driver	Time
Voisin	Rugier	6:35.09
Voisin	Durai	6:37.31
Voisin	Gauderman	6:42.57
Peugeot	Billot	6:46.41
Voisin	Piccioni	6:49.58
Peugeot	Artault	7:21.25

Voisin and Peugeot engines are of the Knight sleeve valve type, but are not manufactured under Knight's license, for these patents are no longer valid in France. The Voisin is claimed to be the firm's standard sporting model, which is designed on the same general lines as the stock models but has many detail modifications. Cylinder dimensions are 95 by 140 mm. There is a direct supply of oil to the sleeves and in addition to a Zenith magneto, driven off a cross shaft at the front, there is Delco equipment.

TWO NEW JEWETT MODELS

DETROIT, July 17—Paige Detroit Motor Car Co. has added a roadster and coupe to its Jewett line and is now in production on these, rounding out the line to four models, the touring and sedan having been in production earlier. The roadster is priced at $1,065, same as the touring, and the coupe at $1,395 is priced the same as the sedan.

Sales Increase in Farm Sections

Postoffice Department Plans To Move Mails With Trucks

If Strike Stops Trains Regular Service Will be Maintained Between Large Cities

WASHINGTON, July 17—Plans to use hundreds of surplus automobile trucks to carry mail between cities in sections where strikers, during the pending railway employes' strike, disrupt the mail service, have been announced by the Post Office Department. The War Department is ready to co-operate with the Post Office Department in trucking the mail between the principal mail centers throughout the United States, it was stated.

Between the two departments more than 6,500 trucks are available immediately and have been put in readiness to be used at the first sign of a breakdown in the mail transportation system. Decision to use the mail trucks, including surplus War Department vehicles, came after a conference between Postmaster General Work and H. H. Billany, fourth assistant postmaster general, in charge of the motor vehicle service of the department.

The motor vehicle service of the Post Office Department owns and operates about 4,000 trucks throughout the country. Most of these are engaged in carrying parcel post between cities on regular daily schedule, doing an especially heavy business at this time of the year, when farmers are sending their products to city buyers, and when summer visitors at resorts use the trucks to make purchases in the city.

In the event of a tie-up of mail trains by strikers, the plan is to divert the use of these trucks, owned by the department, and put them in regular mail service. To this number approximately 2,500 vehicles, owned by the War Department, will be added and the general situation was viewed today with considerable relief by postal officials, who announced that they are prepared to "shoot" the motor trucks into service if necessary.

Annual New York Show to be Held Week of January 6

BUFFALO, July 15—The most important action taken at the meeting of the directors of the National Automobile Chamber of Commerce at the Buffalo Country Club this week was the decision to hold the annual New York show the week of Jan. 6.

Col. Charles Clifton, president of the N. A. C. C., presided at the meeting. Reports received by General Manager Reeves show that sales of cars and trucks are holding up well all over the country but that something of a slowing up may be expected soon. Much gratification was expressed over the extraordinary production record of 271,000 cars and trucks in June.

June Establishes New Production Record

NEW YORK, July 15—Another new record for production of passenger cars and trucks was established by the automotive industry in June with a total of 271,000. This exceeds by 15,000 the May record of 256,000. This would make a total for the second quarter of 746,000 and for the first half year of approximately 1,120,000. The total for 1921 was 1,668,000. The gain over June 1921 was 51 per cent.

CHANGES IN THE CASE CARS

RACINE, Wis., July 14—The J. I. Case Threshing Machine Co. has brought out its new model W, which replaces the previous Model V. The new car is slightly longer, the wheelbase being 129 in., as against 126 on the older model. The engine bore is 3⅝ in. as against 3½. The stroke is the same, 5¼ in. The prices on the new model are:

5 pass. phaeton	$2200
7 pass. phaeton	2250
Coupe	2850
Sedan	3250

These prices are several hundred dollars higher than the previous model V. Prices on the Model X, which is to be continued, have been reduced. Following are the old and new prices:

	Old	New
2 pass. roadster (new)		$1750
5 pass. phaeton	$1890	1790
Coupe (new)		2550
Sedan	2790	2690

TWO NEW LIGHT TRUCKS

DETROIT, July 14—The Standard Truck Co. is ready to go into production on a new model 1¼ ton high speed truck designed especially for the farm market. It will sell at $1330 and will make 35 miles an hour. It has been designed to give an unusually high mileage per gallon of gasoline. The truck will be called Model 75.

The Federal Motor Truck Co. is preparing to bring out a light express job designed particularly for speedy service.

FRANKLIN FOUR DEVELOPED

SYRACUSE, N. Y., July 15—Development of the production model of the Franklin Four, planned for the market in 1923, has been concluded, and within the last two weeks the car has been exhibited privately at the factory to Franklin dealers from all parts of the country.

Slight Decline in Cities Counterbalanced in Country

Factory Production Schedules Somewhat Reduced, But May Total 200,000 for July

NEW YORK, July 17—While the entire industry is awaiting the expected midsummer lull in business and is prepared for it, a decline in sales has become apparent only in spots. There has been a slowing up in New York, Chicago and other big cities but nothing which can be characterized as a slump.

Factories report, on the other hand, that dealers in agricultural districts who have been more or less quiescent for a long period, are sending in substantial orders. This is a positive indication that the farm market has come to life because these dealers are not taking cars merely on a chance of selling them.

Production schedules have not been curtailed materially and while the output in July will not reach the June record of 271,000, it would not be surprising if it approximated 200,000. Last July, with a production of 176,000 passenger cars and trucks, was the best month of the year with the exception of August.

Parts makers have noted no shrinkage in the volume of their business. All of them assert their July sales will be as large as those for June and a good many say their business will be better this month. Commitments indicate that August will be equally good, but commitments under present conditions do not make a thoroughly reliable barometer.

Truck production continues to average between 10 per cent and 12 per cent of the total output. Substantial sales of light commercial vehicles are expected in the agricultural districts, but sales of heavy duty trucks still are handicapped by the presence in this country of a considerable number of unabsorbed American made army trucks sold in Europe after the armistice and reimported. Several thousand more of these trucks will be brought into the country unless Congress passes the Graham resolution which would impose a prohibitive re-import duty.

Any forecast of production for the remainder of the year is complicated by the fact that a serious freight blockade on the railroads seems certain to follow the resumption of coal carrying, together with the grain harvest which must be moved in a short time. With an unprecedented amount of equipment in bad order because of the shop men's strike, it appears inevitable that the carriers will be unable to handle the volume of miscellaneous freight which will be offered them during the third quarter.

Gasoline Prices "Juggled," Says N. A. D. A., Gives Figures

Comparison of Charges in 28 Cities Over 12 Months Indicates Lack of Competition

ST. LOUIS, Mo., July 15—Comparative costs of gasoline for the last twelve months at 28 representative cities of the United States indicate a mere "juggling of prices," according to a request to the Federal Trade Commission for a complete investigation into this phase of the situation by the National Automobile Dealers' Assn. Copies of information in the hands of the association also have been forwarded to Senator LaFollette of Wisconsin and Senator McKellar of Tennessee, who have called for an investigation in the United States senate.

Prices of gasoline at the service station have risen a minimum of two to a maximum of seven cents, the association shows. Some cities show sharp decreases in one month and equally sharp increases the following months. In only one city was there any indication of a price based upon competition, that being the city of Dallas, Tex. In Dallas gasoline dropped as low as 14 cents in Sept., 1921, while other cities were paying from 18 to 28 cents, but in June of this year the competition evidently seems to have been overcome as gasoline went to 25 cents and remains at that figure.

Some of the most important cities in which marked increases have been shown are Kansas city from 17.7 a gallon in July, 1921, to 24.5 in July, 1922; Detroit, 20.9 in July, 1921, to 26.4 in July, 1922; St. Louis from 19.7 to 25.5; New Orleans, 20.5 to 27.5; Jacksonville, 20 to 26, for the same period. New Orleans in the heart of the oil country is paying 27.5 cents a gallon for gasoline; Boston, several thousand miles away, is paying 28 cents.

"There seems to be a pretty general movement among the gasoline producers to force the price of gasoline to 30 cents a gallon everywhere before the automobile touring season is over," according to a statement of C. A. Vane, general manager of the dealer association. "Recent press dispatches indicate that the oil men are in general accord on 'suggestions' that gasoline should be two or three cents higher. They are basing these assertions upon claims that production costs have increased to such an extent that they are no longer able to manufacture profitably.

"Gasoline prices for July, 1921, averaged about 22.25 cents for the country as against 26.45 cents for July this year. This is nearly a 20 per cent increase. The manufacturers of automobiles, on the other hand, have steadily lowered the cost of their product to their consumers, and it appears on the surface that there must be something fundamentally wrong with the oil industry if it cannot readjust its production costs to fit general conditions in which all other business has reduced its cost similarly.

"It is true that during the war prices generally were agreed upon that would give the 'weak sisters' in many industries, including the oil industry, the lowest at which they could produce and then the government relied upon the excess profits tax to take away from the careful manufacturer who kept his costs to the bone, the difference he realized between his costs and the minimum at which the 'subsidized' manufacturer could produce profitably.

"The oil industry apparently wants to prolong the war forever. Here in the end of the fourth year of peace we find them clamoring for a return to a system that is condemned by all economists and had as its only justification the fact that it was a war measure.

"Twelve million motorists who consume on an average of about 400 gallons a year each would like to have some assurance that there really is competition in the oil business or whether the so-called 'trust' and the so-called 'independents' are not merely back door and front door names for the interests controlling a very necessary commodity in American life."

How Gasoline Prices Varied in 28 Cities

ST. LOUIS, July 15—A table of month to month gasoline prices compiled by the National Automobile Dealers' Assn., showing the fluctuation follows:

	1921					1922						
City	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July
Boston	26	27	27	27	28	30	30	29	26	26	27	28	28
Philadelphia	26	25	24	24	27	28	28	26	26	26	28	29	29
Newark	24	24	24	23	26	27	27	26	25	25	27	28	28
Baltimore	23.5	23.5	23	22	25	26	25	24	24	24	26	27	28
Charleston	25	25	25	23	26	27	26	25	25	23	26	27	28
Chicago	20	20	19	19	20	21.5	21.5	21.5	21.5	21.5	23	24	24
Detroit	20.9	18.9	18.9	18.9	20	22.4	22.2	22.2	22.2	23.2	24.2	25.4	26.4
Milwaukee	20.3	20.3	20.3	20.3	20.3	23.2	23.2	21.9	21	22.9	23.9	24.7	25.7
Des Moines	20.6	20.6	20.6	20.6	20.6	22.2	22.2	22.1	22.1	23.4	24.4	25.4	26.4
Indianapolis	20.6	18.4	18.6	18.6	20	22.1	22.1	21.8	21.8	22.8	23.8	24.8	25.8
Kansas City, Mo.	17.7	17.7	16.7	16.7	16.7	19.2	19.2	19.2	20.2	22.1	22.2	23.5	24.5
St. Louis	19.7	19.7	19.7	19.7	19.7	21.2	21.2	21.2	22.2	22.2	23.2	24.5	25.5
Cleveland	21.5	21	21	21	22	23	23	23	23	23	24	25	25
Cincinnati	21.5	21	21	21	22	23	23	23	23	23	24	25	25
Youngstown	21.5	21	21	21	22	23	23	23	23	23	24	25	25
Little Rock	21.5	21.5	19	20	20	25	23	22	22	22	20	25	26
Galveston	18	15	18	20	21	23	23	22	22	22	21	25	25
Dallas	18	18	14	20	21	21	18	18	21	22	21	25	25
New Orleans	20.5	19.5	18.5	18.5	20.5	24.5	24.5	22.5	22.5	22.5	24.5	27.5	27.5
Louisville	20	19	19	19	21	23	24	23	23	23	24	26	26
Atlanta	21	20	23	22	24	27	26	25	25	25	27	29	29
Jacksonville	20	19	21	22.5	22	25	24	23	23	23	23	25	26
Denver	23	23	23	23	23	24.5	23	23	23	23	25	27	28
Salt Lake	29	26	26	26	26	26.5	26.5	26.5	26.5	26.5	28.5	30	31
Cheyenne	23	23	23	23	....	....	23	23	23	23	24	26	26
Seattle	26	26	24	24	25	25	25	25	25	25	25	25	25
Spokane	30	30	28	30	29	29	29	29	29	29	29	29	29
Los Angeles	25	23	23	23	23	23	23	23	23	23	23	23	23

I. H. C. TRUCKS REDUCED

CHICAGO, July 15—Price reductions on three truck models have been announced by the International Harvester Co., effective July 8. The models and prices follow:

	Old price	New price
Speed truck (2000 lb. capacity)	$1500	$1250
Model 21—1 ton	1750	1550
Model 31—1½ ton	1850	1650

General Motors Truck Co. Branch Managers Meet

PONTIAC, Mich., July 15—Branch managers of the General Motors Truck Co., representing 10 factory branches covering the whole United States, were at a three-day convention held at the plant here, ending Friday, July 14. The assembly was called as a wind-up for the sales year, and in anticipation of the new contract year, which opens Aug. 1.

The managers attended a dinner meeting at the Bloomfield Hills Country club and another at Deer Lake. They spent the day sessions at the plant offices, where general prospects were reviewed.

The utmost optimism was manifest at the sessions, there being a settled impression evident that the truck business is on the verge of a still greater revival than has been thus far experienced. Greater sales of heavy duty machines were forecast with the return to the market of industrial concerns which have not been buying as largely as the factors in the market which call for lighter models.

WINTON ABOLISHING BRANCHES

CLEVELAND, O., July 17—The Winton Co., in a public statement, announces it is gradually abolishing its extensive branch system for the distribution of Winton cars and is substituting for it a general dealer representation. The large branches in Boston and New York have been abolished.

This company met with a financial setback in 1920, and since October, 1921, has been operating under the supervision of a creditors' committee, represented by Edwin McEwen as general manager. It states that 50 per cent of the indebtedness involved has been paid off in cash and that the company has current assets double the amount of the balance.

Ten-Story Motor Hotel Plans for Chicago Near Completion

Homer D. Jackson at Head of New Project to Give "Windy City" Inside Parking Place

CHICAGO, July 17—Plans for the construction of a 10-story garage, or automobile hotel, in the loop district of Chicago, first announced in August, 1921, are nearing completion, according to Homer D. Jackson, president of the Interstate Garage Corp., the company which was organized to carry out the undertaking.

Jackson said today that he hoped work on the construction of the garage would start within 60 or 90 days, and that the enterprise would be ready for operation by next summer. The financing of the company, having an authorized capital of $1,750,000, and incorporated under the Illinois laws, is practically complete, Jackson said.

The building is to be at Wabash avenue and South Water street, just north of the loop and one block from Michigan avenue, the city's great north and south through automobile boulevard. As planned, it will have storage for 1000 automobiles, and it is to be so constructed that its capacity may be doubled by the addition of 10 stories if business justifies it. The promoters believe that the great congestion in the loop district and the difficulty of finding parking space will cause the garage to be used to its capacity for day storage of cars.

As planned, the building will be in two sections with floor levels of one falling midway between the levels of the other, so that the ramps or inclined planes connecting the floors will have a rise of only six feet from one floor to the next. Elevators also are to be provided.

TRUCK BODIES CONSIDER MERGER

MACKINAC ISLAND, Mich., July 15—Negotiation with a view to amalgamation of the National Association of Commercial Haulers and the National Team and Motor Truck Owners' Association were held here this week in conjunction with the annual meeting of the National Furniture Warehousemen's Association.

It was announced by Tom Snyder, secretary of the Haulers, that a committee had been appointed on behalf of that organization, to place a merger proposition before the team and truck owners at the latters' convention at Cedar Point, O., early in August.

NASHVILLE SALES INCREASING

NASHVILLE, Tenn., July 17—Business among Nashville automobile dealers continues to increase, the main drawback reported by some of them being inability to get cars with which to meet the demand. This is the case with the Broadway Motor Co., Studebaker distributors, which had 48 unfilled orders on file at the close of last week. "Fine," is the way the Imperial Motor Car Co., Hudson-Essex dealers, describes its business, while the Stockwell Motor Car Co., which handles Cadillacs, declares that cars are being sold faster than received and that this promises to be the company's greatest year.

The contract for the sale in Middle Tennessee of Durant automobiles has been closed by the reorganized Lexington Sales Co. Clark E. Sloan, former sales manager of the Broadway Motor Co., has assumed active management of the Lexington company and an organization of salesmen and mechanics has been tentatively selected.

FRAUDULENT DEALER ARRESTED

BOSTON, July 18—How Boston tire branches were victimized by a Boston accessory dealer to the amount of $30,649 was brought out in court here when Daniel A. Doyle, Jr., with a store on Columbus Avenue, was arraigned on a secret indictment warrant. According to the police, Doyle ordered quantities of tires and tubes from various manufacturers, had them charged to his credit, then quickly sold the goods below the market price for a quick turnover, withholding payment for the stock.

Gasoline Consumption and Production Increase Rapidly

WASHINGTON, July 15—Reflecting the tremendous increase in the use of motor vehicles during the late spring and early summer months, refinery statistics for May, as compiled by the Bureau of Mines, show that domestic consumption of gasoline is breaking all records. The May consumption figures are within 4,000,000 gallons of the August peak figures, although occuring three months before the customary month of largest consumption. Stocks have been abnormally reduced through sales to jobbers and it is expected that the June consumption figures will exceed the high mark of August of last year.

Total gasoline consumption for May amounted to 499,242,343 gallons against a production of 513,658,966. The daily average consumption amounted to 17,949,178 gallons. These figures relating to consumption include exports and shipments to insular possessions. Production of gasoline increased 41,000,000 gallons over the month of April.

According to the Bureau of Mines, "A decrease of 35,661,000 gallons in storage also occurred. Domestic consumption jumped from an increase of 12,000 gallons in April over March to an increase of 114,000,000 gallons in May, as compared with April. The maximum monthly consumption of gasoline usually occurs in August. Consumption during that month in 1921 was 503,500,000 gallons, a figure also representing the greatest monthly consumption on record."

WORK ON KANSAS CITY SPEEDWAY

KANSAS CITY, Mo., July 15—The Kansas City Speedway Association is pushing work on the track and grandstand at the new Speedway and expects to hold the first race Sept. 15.

Six Companies Announce Several Price Changes

Pierce-Arrow Models Materially Reduced—Some Others Increased Slightly

BUFFALO, July 17—The Pierce-Arrow Motor Car Co. announces substantial reductions in the prices of all its passenger cars. The list follows:

	Old Price	New Price
4 and 7-passenger Touring	$6,500	$5,250
Coupe	8,000	7,000
Sedan	8,500	7,000

Stanley Prices Revised

NEWTON, Mass., July 18—The following price changes have been announced by the Stanley Motor Carriage Co., affecting its entire line of models:

	Old Price	New Price
2-Passenger Roadster	$2,800	$2,700
5-Passenger Phaeton	2,600	2,700
7-Passenger Phaeton	2,600	2,700
Sedan	3,850	3,950

Monroe Increased $75

INDIANAPOLIS, July 18—An increase in price of the Monroe affecting both the roadster and 5-passenger phaeton has been made by the William Small Co., as follows:

	Old Price	New Price
2-passenger Roadster	$ 875	$ 950
5-passenger Phaeton	875	950

Davis Phaeton $100 More

RICHMOND, Ind., July 15—The Geo. W. Davis Motor Car Co. has announced an increase in price of $100 on its model 71, 5-passenger phaeton, the new price being $1,295.

New Earl Model

JACKSON, Mich., July 14—Earl Motors, Inc., has announced a new enclosed job, a four-passenger car, called the Cabriole, the price of which is $1,395.

Some Lafayette Increases

INDIANAPOLIS, July 17—Lafayette Motors Co. announces an increase in the price of its coupe from $5,000 to $5,500 and of its sedan from $5,175 to $5,500.

REPUBLIC BUILDING MORE TRUCKS

ALMA, Mich., July 19—The Republic Motor Truck Co. reports that its factory is now working at about 50 per cent capacity and that in July it will build more trucks than in any month in two years. Col. Frank E. Smith, president of the company, declares that farmers in Kansas and Nebraska have started buying and that the farm demands promise good business through the summer.

DORRIS SELLING CAMPAIGN

ST. LOUIS, July 15—Dorris Motor Car Company announces that it will inaugurate the most aggressive and vigorous selling campaign in its history following the recent reduction in prices. The campaign will be in charge of W. A. Chapman, recently appointed director of sales.

Retail Sales Maintain High Level in Cleveland

June Business Equaled That of May and There Has Been No Noticeable Decline This Month

CLEVELAND, July 17—The retail automobile business in Cleveland during June kept well abreast of the phenomenal business transacted in May, according to figures compiled by the Cleveland Automobile Manufacturers' and Dealers' Association, 5005 Euclid avenue, and made public by Herbert Buckman, secretary.

The number of cars delivered at retail in the city of Cleveland kept almost at the same level through the list of local distributors. A few lines showed a decrease, and this is ascribed in general measure to shortages. Due to the large volume of business in June this shortage has become more acute, and salesrooms of even some of the biggest producers are short of models.

June retail sales in the Cleveland district will run past the 2,700 mark, says Buckman. This is on a par with May business, and that figure includes only the new 1922 models, delivered at retail and does not include the used cars, which run to about the same total.

A seasonal decline has been predicted for the late summer months, but that has not made itself felt to any great extent.

Dealers questioned about the prospects for the immediate future, assert that workingmen are getting back into the market again, as they are just getting on to their feet after being idle late last year and the first few months of the present year.

The harvest season is on in Ohio, and distributors who have large sections of the state report the agriculturists are buying more freely. The farmers of Ohio had "hard sledding" in the year 1920, and they did little buying. But prices for their products have gone up and they are in better shape financially this year.

SALE OF PAN-AMERICAN ASSETS

DECATUR, Ill., July 15—Receipts of the Pan-American Motors Corporation auction sale amounted to $19,817, according to a detailed report filed in the circuit court by the receiver. The expense of the sale was slightly above $2,000, leaving $17,425 to be applied upon the dividend. The sale disposed of machinery, accessories, parts and other materials, which had been inventoried at $100,000, indicating a shrinkage of more than 80 per cent. Roadster bodies brought $25, while a collection of nineteen taxicab bodies brought only $570 for the lot. Two sedan bodies went for $100. Wire wheels went for a song, 189 sets bringing as many dollars. One firm bought 66 sets of fenders for $147, while 330 tanks brought but $433. A collection of 344 springs went for $119. The total was so far below expectations that the amount to be distributed among the stockholders will be very small. It is expected, however, that the court will approve the sale as it is believed that the receiver received the maximum that could be obtained in view of conditions.

DURANT BIDS FOR LOCOMOBILE

NEW YORK, July 13—W. C. Durant has presented to the receivers of the Locomobile Co. a proposition to take over the property on a basis which is satisfactory to them. This proposal now has been put up to the creditors committee with the recommendation of the receivers that it be accepted. It is understood that the Durant plan does not contemplate a cash transaction but rather the promotion of a new company and an exchange of stock for that of the present Locomobile company and two creditors in settlement of their claims. It is assumed that Durant will retain control.

BILL TO REDUCE LICENSE FEES

ATLANTA, Ga., July 15—A bill to reduce the state license fee on all classes of automotive vehicles has been introduced before the Georgia State Legislature, now in annual session here.

"School Week" for Dealers

NEW ORLEANS, July 19—Dealers in Dodge automobiles in Louisiana and Mississippi attended a "school week" here, at which T. H. Waide lectured on the parts and construction of the Dodge cars. The dealers were entertained by C. D. Lyon, representative of Dodge Brothers.

FISHER BUYS BEAUDETTE PLANT

PONTIAC, Mich., July 18—Purchase by the Fisher Body Corporation of the O. J. Beaudette Co. plant in Pontiac, manufacturers of automobile and buggy bodies for the past 32 years, was announced here today by O. J. Beaudette, who likewise announced his intention to retire. With him will go his brother, M. J. Beaudette, who has been associated with him since the pioneer days of the automobile industry.

The Fisher Corporation, according to Fred J. Fisher, president, will continue manufacturing bodies in the plant, which has been devoted to Ford work for 16 years. As soon as the arrangements can be made, which will require about 90 days, he said the force will be increased to full capacity at the plant, which has been running at about half capacity.

WINS MILE RACE IN 54 SECONDS

POTTSDOWN, Pa., July 19—One second was cut from the record of the one-mile Mill Park dirt track this afternoon, when Elwood Wolfe, Philadelphia sped over the course in a Ford in 54 seconds. Joe Rogers, Brooklyn, last fall established the previous record of 55 seconds.

"Help Yourself" Garage to Be Built at Kenosha, Wis.

Storage Customers to Have Use of Repair Shop to Do Their Own Tinkering

KENOSHA, Wis., July 15—"The Help Yourself Garage" is coming to Kenosha. Ground was broken this afternoon for the erection of such a garage on Sheridan road just back of the court house. Dr. George L. Ross is to be the owner and will have charge of the operation of the new garage. It will be 64x126 feet in size and have a storage capacity of 60 automobiles. The building will be of all-steel construction and fire-proof. It is to be ready for use on the first of August.

"This is going to be an unique garage," declared Dr. Ross, "and I believe it will be a welcome and money saving institution for the men and women in Kenosha who own and operate automobiles. It is going to be a service station different from any of the rest of them. It will have no repair shop connected with it but it will be open at all times as a repair shop. The owner of an automobile will be invited to bring his car to this garage and do his own tinkering. We will provide for his free use of tools and other accessories of a garage, but we will not employ any workmen to help them. We are going to sell lubricating oil. Two years ago we organized the Wisconsin Oil and Supply Co. which proposed to sell lubricating oil to the car owners at wholesale cost plus a small jobber's profit. The business has grown to such an extent that we need larger and more central quarters. Under our plan a man can drive into this garage, drain his own oil and put new oil in the car at wholesale price.

"It is also our intention of offering year round storage for cars at a lower rate than has been offered. We have been of the opinion that car storage has been a bit costly in Kenosha and to the limit of this new garage we are going to take care of all sorts of cars."

OVERLAND BUSINESS INCREASE

TOLEDO, O., July 17—The Willys-Overland Co., announcing that the second quarter ending June 30 was one of the best business periods in its history, states that its sales for the first five months of 1922 throughout the United States were 348 per cent greater than its sales in the corresponding months of 1921. The company expects its deliveries in the next three months to be more than 50,000 cars.

JULY GOOD TRUCK MONTH

ALMA, Mich., July 19—The Republic Truck Co. expects to build more trucks in July than in any month for two years. Farmers in Kansas and Nebraska have started buying and the farm demand promises to provide a good business throughout the year.

Richmond Dealers Having Hard Time Getting Cars

Demand Has Been Overwhelming; Many Men Go to Factories

RICHMOND, Va., July 17—Facing the greatest season in their history, the 60 automobile dealers in Richmond are making efforts to procure more automobiles to meet an unprecedented and unseen demand which has eaten up their supply of automobiles contracted for the year, and every other available car that can be found. Twice as many cars could be sold if they could be procured. Twelve local dealers have visited the factories in the last 10 days begging for automobiles.

"The first to suffer from deflation, the automobile industry is the first to benefit by the good times that are in store for this country," E. C. Anderton, of the Anderton Automobile Co., has stated here. "My business has been better than for any time in the history of the trade, smashing to smithereens the records established in 1919, which we dealers in Richmond considered phenomenal."

"I have never seen anything like it," J. T. Darden, of the Coburn Motor Sales Co., said. "Things have turned out better than we could have dreamed of." Other dealers voiced the same opinions. The forecast here is that the phenomenal business of the last six months will continue, if not increase, during the remainder of the year.

TRACTORS REPLACE ENGINES

BLOOMINGTON, Ill., July 18—Illinois grain will be largely harvested with power from tractors this season instead of steam traction engines. The strike of coal miners has caused many owners of traction engines to tie them up and buy a tractor instead. This situation has resulted in many sales of tractors this year. The Rue Motor Co., of Bloomington, reports the sale of 25 tractors for the month of June, the heaviest movement of these machines in any one month since the farmers' buying strike first developed with the decrease in the value of grain two years ago.

INVESTIGATING RUBBER ROADS

WASHINGTON, July 17—Rubber surfaced roads for automobile highway transportation are being investigated by the automotive division of the Department of Commerce. A report of "rubber roads" has been made to that Department by the American consul at Colombo. Experiments have been under way for more than a year, with the result that the process has been patented.

The rubber surface road dressing, which is the invention of a Ceylon rubber planter, is now being used on a portion of Darley road, which is one of the most used thoroughfares in Colombo. This rubberized road has been in use for the past 13 months, it is stated.

The rubber solution is made from pure bark and scrap rubber. It is a secret formula and the inventor is still working toward its perfection.

NEW BATTERY FACTORY

A transposition of type lines in MOTOR AGE of July 6 caused some inaccurate statements to be made in the news items concerning the Sundby Battery Co. of Milwaukee, Wis. The complete item is reprinted herewith as it should have been:

Sundby Battery Co., a widely known manufacturer of storage batteries, has decided to locate in Milwaukee, Wis., and has purchased the large plant built by the A. C. Holtz Chemical Co., on the Cedarburg road, north of the city, but never placed in actual operation. The plant is large and of daylight construction, having been designed for chemical products manufacture, lending itself admirably to storage battery production processes. The Sundby company already has taken possession and is installing equipment so that production may be started at once.

Bootleggers Defraud Dealers

PHILADELPHIA, July 17—Automobile dealers here are being preyed upon by bootleggers who feel the necessity of "putting on the dog" in the effort to land fashionable customers. So great has become the trade in new cars among bootleggers who make the first payment their last, that several dealers are keeping what they term a "bums' list" made up of the names of those who have purchased new cars by making only the initial payment and "skipping."

The bootlegger usually selects a new make of car. One dealer who handles two makes of cars was stung twice by the same man. If the motor car company patronized by the bootlegger has a contract with a finance company whereby he, the dealer, must buy back the machine when the buyer defaults, that dealer is out of luck.

SALES KEEP UP IN PHILADELPHIA

PHILADELPHIA, July 17—Automobile distributors report trade well sustained in both new used cars, with the greater strength in the latter, owing to special underpriced sales, well advertised. With accessory and supply houses, trade has been spotty and prices notably unstable. This applies to tires, dealers complaining about constantly changing prices.

The frequent and almost daily rains for the last two weeks in June and the first week in July caused a falling off in tire and accessory sales and sales of gasoline fell discouragingly.

E. R. CALDWELL DIES

SYRACUSE, July 10—The death is announced of Edward R. Caldwell, president of the Syracuse Rubber Co. and one of its founders. He was for many years head of the E. R. Caldwell & Son Brass Co.

Bus Tours from Cleveland to New York Inaugurated

10-Day Trip Includes Philadelphia, Atlantic City and Washington for $50 Fare

CLEVELAND, July 17—The Cleveland-Akron Bus Co., which has for several years made a good profit out of a line of motor busses which it has run between this city and Akron in competition with two steam railroads and one interurban line, has now embarked on motor tours.

The company has purchased three easy riding busses that make semi-monthly trips to New York and other principal cities of the east. One other bus is just now transporting honeymooners to Niagara Falls and return. This bus makes a trip every five days.

Next Tour on July 24

The next motor bus tour of the company is scheduled to leave this city on July 24. This trip will include New York City, Philadelphia, Atlantic City, Baltimore and Washington, D. C. The Lincoln Highway will carry the passengers part of the distance. Principal points of interest in the large cities will be visited, as will the battlefields of Gettysburg. The Blue Ridge mountains will be crossed and the return trip from the national capital will be via the National Highway. A limited amount of hand baggage is carried free of charge for each passenger.

The fare for the round trip on the New York City-Philadelphia-Washington journey is $50. This includes sight seeing trips in each city. Arrangements have been made to obtain hotel fare at reduced rates along the route. The buses travel approximately 175 a day.

Passengers will make the eastern trip by the bus in 10 days, but they may charter the bus for additional time by chipping in and paying $25 a day to the company.

BUSY JULY FOR OAKLAND

PONTIAC, Mich., July 18—More orders for motor cars are booked ahead for July production at the Oakland Motor Car plant here than have been on the books for any month in the past ten, according to W. R. Tracy, assistant to C. J. Nephler, sales manager. July promises to exceed June business, which was 50 per cent better than that of June, 1921, and closely approached that of June, 1920, according to Tracy.

Sales in June were greater than any month since the new Oakland 6-44 models were put out.

DOUBLES TIRE OUTPUT

AKRON, O., July 15—The Lambert Tire and Rubber Co. of Barberton, producers of a patented cushion tire, has announced that production is being doubled to meet increased demand for the product.

High Level Maintained By Retail Sales in Milwaukee

Slight Decline in Orders, But Dealers Still Able to Sell All Cars They Can Get

MILWAUKEE, Wis., July 17—Retail sales in the first half of July again represented a handsome gain over the same period in 1921, although a good many dealers say that volume is not so large as in the same periods of the months of May and June. However, this is a more or less expected development, and the situation is not at all cause for complaint, for most dealers are able to deliver virtually everything they can get from the factories. Most of them are fairly well caught up on open cars, but remain as badly behind on orders for the enclosed types as a month or two ago.

For distributors this season is an especially busy one because many contracts are pending. This year, it is intimated, the new contract season is accompanied by somewhat larger problems than usual. While none of the distributors are ready to talk reports are current that car manufacturers are gradually effecting a change in merchandising policies whereby a slicing of territories is involved. In other words, it is said that some of the larger terrtories are to be split up and some distributors will have to take much more restricted areas on the distribution basis than they have held for many years past.

So far as this territory is concerned, the bulk of distributor contracts are written to embrace the geographical unit of the state of Wisconsin plus the Upper Peninsula of Michigan, which form the territory of Milwaukee jobbers in most commodities besides motor vehicles.

Factories Busy at Milwaukee.

MILWAUKEE, Wis., July 17—Manufacturers of automotive parts continue to keep busy at the high point of capacity reached recently, the demand from passenger and commercial car builders being well sustained and shipping directions absorbing output from day to day. Greater interest among tractor builders is apparent, and it is felt that present schedules will doubtless have to be kept in effect for at least three months.

Passenger car manufacturers in this district are working at the heaviest capacity possible in view of the shortage of bodies, open as well as enclosed, and the inadequacy of supply of some other important elements which cannot be obtained as readily as production schedules demand. The body situation is generally regarded as the main adverse influence on output.

Automotive equipment is moving so well through jobbers and dealers' hands that manufacturers are unable to get production to an equality with delivery specifications. This refers both to car manufacturers' equipment and specialties for the owner trade. The call for bumpers is the largest on record and this piece of equipment is selling more rapidly than it can be produced.

GOOD JUNE BUSINESS IN INDIANA

INDIANAPOLIS, July 18—Wholesale and jobbing accessory business for Indiana during month of May was far ahead of any month during the last year. Investigations shows that June business seems at least up to May and in many cases will exceed it. The general report of the leading jobbing houses in this city which sell to all of Indiana is that for the first three months of this year the business was on a general level that in some cases was quite low. During April the upturn came, but it was not until May that the sales and shipment curve made a sharp upward line. In almost every case the large accessory jobbers found May far ahead of any month for this year, and in most cases the business exceeded that of any month during 1921.

FORD BODY PLANT ENLARGES

MILWAUKEE, Wis., July 17—The Ford Motor Co.'s body plant and principal woodworking factories, established a year ago at Iron Mountain, Mich., under the name of the Michigan, Land, Lumber & Iron Co., will be doubled in size at once by the erection of a second unit. This has come to light through the letting of a contract to the Worden-Allen Co. of Milwaukee for the structural steel work on the new shop. The Iron Mountain plant is in the heart of the best growth of hardwood timber as well as an extensive softwood belt in the Upper Peninsula of Michigan.

PRODUCING DOUGLAS TRUCKS

OMAHA, Neb., July 18—The Douglas Motors Corporation, manufacturer of the Douglas truck, after a shutdown of a few months, has again started production of trucks.

Dealers Opposed to Taking in Used Cars Have Another Plan

Richmond Firms Would Sell Vehicles for Owners, Proceeds to Apply on New Purchase

RICHMOND, Va., July 17—Abandonment of the Saginaw Plan of handling the used car and the adoption of the "Richmond Plan," as originated by B. A. Blenner, Cleveland dealer here, is being agitated among the members of the automobile business in Richmond. The new plan calls upon the dealers to discontinue acceptance of automobiles in trade for new cars, but to dispose of old automobiles for owners without commission or rent for space providing that in case the old machine is sold the purchase money is applied on a new automobile.

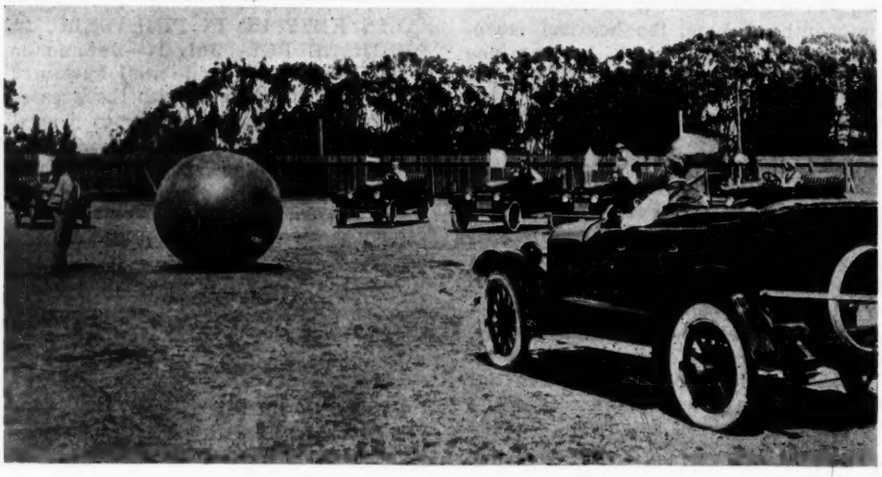
Inability of local dealers to get credit on capital invested in second hand cars, and the trouble which the dealer has in disposing of cars of this kind, in which many local concerns have thousands of dollars tied up, led to the advocacy of this system.

Approximately 90 per cent of the automobiles purchased in Richmond are bought on the credit plan, and bankers after studying the proposed system believe it would increase the credit standing of dealers.

FORD TO ENLARGE FACTORIES

DETROIT, July 15—Announcement was made after a visit to Henry Ford by a delegation of Minnesota business men, that he would build additions costing several million dollars to his factories near the high dam at Minneapolis and St. Paul. Ford was offered the water power now going to waste provided he would build a plant employing between 4,000 and 5,000 men.

Getting Thrills Out of Driving



SAN FRANCISCO, July 15—Automobile pushball as shown in the accompanying photograph, has furnished thrills for a number of San Francisco drivers. Six automobiles are used and the game is played similar to polo.

"Shop Profits" Campaign of A. E. A. Is Under Way

Meetings Held at Columbus and Memphis—"Ask 'Em to Buy" Movement Continues

CHICAGO, July 17 — The "Shop Profits" campaign of the merchandising department of the Automotive Equipment Association is well under way, following the first showing of the new motion picture at the Colorado Springs meeting of the association.

Meetings were held July 7 at Columbus, O., and Memphis, Tenn., at which the "Shop Profits" film was shown. Ray W. Sherman, merchandising director of the A. E. A., had charge of the Columbus meeting. The "Ask 'Em to Buy" campaign is being continued and in territory where the motion picture on this subject has not been shown two meetings usually are arranged, the first for the showing of "Ask 'Em to Buy" and a later one for "Shop Profits."

Sherman will spend the week beginning July 24 in Southern Ohio and West Virginia, addressing meetings of automobile and accessory dealers, salesmen, mechanics and garage proprietors, and showing the two films.

A recent tabulation shows that since the inauguration of the merchandising campaign about a year ago there have been held 618 meetings attended by approximately 50,000 dealers and their employes and other persons.

Letters from dealers showing how they have profited by the "Ask 'Em to Buy" campaign are being received by Sherman in increasing number. A recent one told of increase in monthly sales from $200 to $1400 with consequent increase in profit from $50 to more than $300.

BUYS MORE PASSENGER BUSES

CHICAGO, July 15—The Walton Bus Service, operating buses to pleasure and picnic parks near here, has placed an order with two truck manufacturers for four more buses to be added to its fleet. Walton officials say that this year, more than ever before, people are traveling by motor bus.

When the order just placed has been filled, the Walton company will have in operation 13 buses on highways near Chicago. An interurban truck express service with six trucks is also conducted by this company.

FARMERS BUYING MORE CARS

TOLEDO, O., July 17—The June vocational records of sales by the Willys-Overland Company shows increase buying of automobiles by farmers, as the harvesting period approaches.

This record shows that farmers bought 81 per cent more Overland cars than did members of any other vocation. Laborers came next with approximately 10 per cent of the total Overland output for the month. Merchants, salesmen, clerks, foremen, physicians followed in the order named. The list included 123 vocations and embraced waiters, editors, actors and auctioneers.

As buyers of Willys-Knight cars, farmers were fifth on the list. The company believes that the different relative position of farmers as buyers of this $1,375 car as compared with the $550 Overland shows how greatly the farmers' purchasing power has been reduced. Merchants led in the purchase of Willys-Knight cars. Salesmen, physicians and laborers followed in the order named.

DEALERS DRIVE AWAY 100 REOS

DETROIT, July 17—Pennsylvania day was observed at the Reo Motor Car Co. plant at Lansing this week with the appearance of a large delegation of distributors and dealers from the central part of the state who staged a drive-away from the factory of more than 100 cars, speed-wagons and the new Reo taxis.

George G. McFarland, president of the Harrisburg Automobile Co., headed the delegation. A luncheon was tendered them by the company at the Reo clubhouse on their arrival and the afternoon was spent in an inspection of the plant. Dinner was served in the Kerns Hotel in the evening following which a musical program was given by the Reo orchestra and glee club.

French Automobile Industry Showing Rapid Recovery

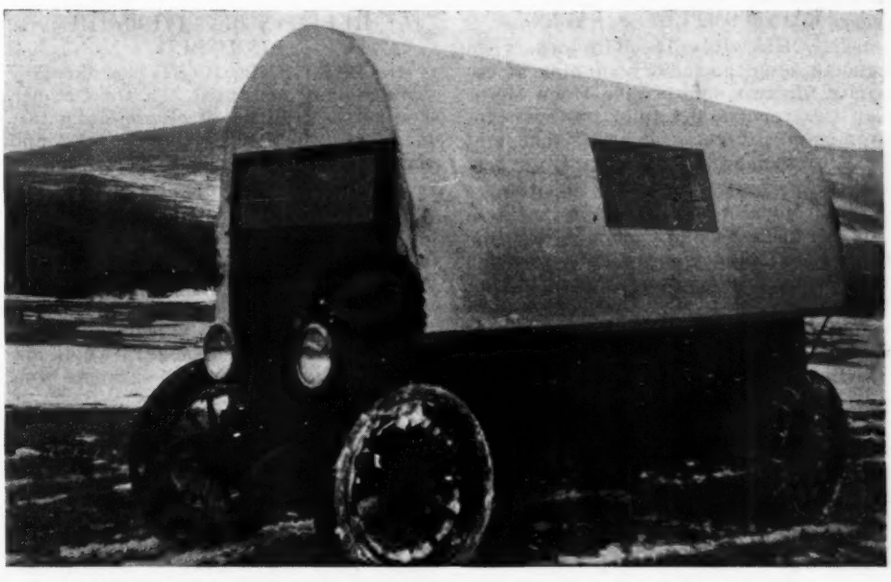
Head of Manufacturers' Syndicate Says Crisis is Passed—Cheaper Gasoline Helps

WASHINGTON, July 15—The French automobile industry has passed the severe period of the general industrial crisis and is gradually getting back to its normal state. This is the opinion of Baron Petiet, president of a syndicate of automobile manufacturers, in an authorized interview on the automobile situation with representatives of the Department of Commerce.

In the opinion of the French automobile manufacturer the development of that industry in France will go forward by rapid strides in the immediate future. Practically all of the companies have been reorganized. Compared with 1921 when all of the companies are reported to have lost money, favorable profits the first six months of this year are reported.

The decrease in the price of gasoline is attributed in a large measure to the recovery of the automotive industry. Gasoline has decreased from 16 francs per five-liter can to 8.50 francs in Paris and 7.35 francs outside of Paris.

"Old Betsy" Takes the Plains Children to School



Getting the children to school regularly out on the broad plains of Wyoming where settlements are far apart and blizzards frequent, is a task that has been successfully accomplished by an automobile. The Buick car shown in the above photograph has been used for this purpose for some time and has come to be known by the children as "Old Betsy."

The problem of getting combined capacity and warmth was solved by constructing a body like that of a sheep wagon. To make the car roomy, the body was extended over the engine. Large sheets of celluloid, protected by a closely woven wire netting, permit the driver to see out at both sides and at the rear. A slatted floor above the engine permits the heat from the motor to enter the car and directly over the engine are seats for eight children, so arranged that the children when seated do not obscure the driver's view. The car has carried 44 children at one load.

Farmers Enjoying Added Prosperity Down K. C. Way

Oklahoma and Kansas Show Marked Improvement Now

KANSAS CITY, Mo., July 15—Business in Oklahoma and Kansas and other sections in the Kansas City territory has shown a decided improvement in the past few weeks, according to dealers along Motor Row. Dealers believe that a change for the better will come soon and continue until the cold weather sets in.

Farmers seem to be enjoying added prosperity at this time of the year and many of them are investing their money in motor cars. Wheat has been harvested in the middle west and reports are that all other crops show prospect of being large ones. The late fruit crop promises to be a record breaker. This will mean that the farmers will be more ready to buy this fall than they are now. More money will be in circulation all over this section, no doubt, than for several years.

Not only has business been good with the new cars, but used car sales have taken an increase, according to reports from dealers of used cars. At the time the announcement was made several months ago that there would be a price cutting on all new lines, the used car sales took a slump.

RAIN COMPLETES SALES

ST. LOUIS, July 17—With orders on hand to keep the factory running at capacity for two months, the Moon Motor Car Co. reports its June business approximately 20 per cent better than that for May which was the company's best month by 64 per cent up to that time.

The company expects good business this fall in the farming communities. One of its Nebraska dealers recently reported that many orders were given in Nebraska and Iowa conditioned upon rain before July 1. The rain came, breaking a threatened drought, and greatly improving crop prospects.

COLUMBIA ENLARGES SCHEDULE

DETROIT, July 18—Columbia Motors Co. had as dinner guests at the Columbia Club last week representatives of parts makers supplying materials for the new Columbia Light Six, the purpose of which was to urge adequate deliveries to meet the production plans of the company. The slogan of the evening was "1,650 cars in July or bust." President J. G. Bayerline was host to the supply men.

WESTERN SERVICE MEN TO MEET

SPOKANE, WASH, July 18—Service experts representing most of the varied fields in the automotive industry of the country will attend the gathering of automobile repairmen of the state in Olympia in July according to word received by P. J. Garnett, president of the Spokane Automobile Chamber of Commerce.

Among these experts will be the western representatives of the Timken-Detroit Axle Co. and of the Borg & Beck Company, magneto service experts, and others. Papers will be given by them during the repairmen's meeting.

The conference will be held on the first day of the Washington Automotive Trade Association's convention in Olympia, July 21. Other crafts to convene on the same day include car dealers, battery dealers, tire dealers and service stations, accessory men, body and top men, painters and grinders.

More "Store-at-Your-Door" Trucks

OSHKOSH, Wis., June 26. — The Motor Truck Co., Oshkosh, Wis., is filling a repeat order calling for eight "Store-at-Your-Door" trucks for the U-Savit Stores Co. of Dayton, O., which some time ago purchased five "Groceterias" on wheels. The first four of the new order are being shipped to Springfield, O., as an extension of the system inaugurated at Dayton. The traveling grocery stores are mounted on Oshkosh four-wheel-drive chassis, the bodies being of special design and built by the J. L. Clark Carriage Co. of Oshkosh. The trucks represent a cost of about $5,000 each.

HUFFMAN RECEIVERSHIP DISMISSED

ELKHART, IND., July 17—Bankruptcy proceedings instituted last October against the Huffman Brothers Motor Co., manufacturers of passenger cars and trucks, have been dismissed upon motion of the creditors who filed the petition for the appointment of a trustee.

While the plant has been in the hands of a trustee, the company has been designing new models and is now prepared to manufacture a larger truck than heretofore. It will have a capacity of 2½-3 tons. It is understood also that an original design in enclosed cars has been worked out.

TOLEDO TRUSTEES ELECTED

TOLEDO, July 17—Members of the Toledo Automotive Trades Association at their annual meeting last week elected five new trustees for the ensuing two years. They are Warren E. Griffith, for the passenger car division; A. H. Draime, tire and accessory division; C. A. Van Dusen, repair and garage division; M. R. Himes, truck division; R. Myers, electric car and battery division.

GRAY REACHES CHICAGO

CHICAGO, July 15—The Gray car in the open model is now on display at the sales rooms of the Simmons-Handin Motor Co., Chicago distributors, and delivery is being made of the phaetons and chassis. The enclosed models are expected for delivery next month.

Truck and Tractor Caravan Starts on 4000-Mile Tour

Lectures and Demonstrations to Be Given Through the State of Oregon

PORTLAND, Ore., July 15—A caravan of trucks, tractors and trailers left Portland this week on a 4000-mile tour of Oregon, covering a period of three months, for the purpose of giving lectures and demonstrations on the use of trucks and tractors on the farms. The feature is being directed by the Ford Motor Co., Oregon branch, with a large number of other concerns co-operating.

More than 40 machinists, drivers and lectures are with the caravan. The itinerary will cover the entire state, the caravan not only stopping at the main points but going out on side roads to reach the more distant points. Stops will be made at rural towns and at centrally located farms in the different communities, where programs including truck and tractor demonstrations with farm machinery, radio concerts, motion pictures, lectures and prize contests will be provided.

Associated with the Ford Oregon branch in the enterprise are the Standard Oil Co.; Oliver Chilled Plow Works; Ersted Machinery Mfg. Co.; Talbot & Casey, Portland Ford dealers who are agents for the Trailmobile and other tractor attachments; Parson-Gordon Co., Lee line trailer agents; Francis Motor Car Co., Hercules truck body agents; and the Modern Appliance Co., agents for the Delco lighting equipment.

W. H. Goodwin, manager of the Oregon branch of the Ford Motor Co., Portland, is director of the caravan. Goodwin staged a similar caravan in Washington last summer which was a big success. At that time he was asistant manager of the Washington Ford branch at Seattle, but since then he has been promoted to head the Oregon branch.

TRUCK DRIVERS' SAFETY SCHOOL

CHICAGO, July 17—The Motor Drivers' School of the Chicago Safety Council was concluded June 27 when diplomas were awarded to 356 chauffeurs and truck drivers who satisfactorily completed the course of instruction in safety, rules of the road, loading, braking and other subjects of interest to motor truck operators. The school had been in session one night each week since early spring.

ONLY 5 PER CENT EXPORTED

WASHINGTON, July 18—Exports of passenger cars and motor trucks during the past nine years, show, according to estimates based on figures compiled by the automotive division of the Department of Commerce, that the American car manufacturers have sold abroad approximately five per cent of their total production.

IN THE RETAIL FIELD

The Yarham garage at Des Moines, Ia., for the last three years located at 1508 Twentieth street, has moved into the building formerly occupied by the Allen Auto School, at 2008 to 2014 Forest avenue.

J. B. Johnson, Danville, Ill., has opened a new garage at 119 Hazel street. He was formerly a mechanic at the Ford agency in that city. He will specialize in repair and storage.

Lewis M. Smith and J. W. Rile have organized the Everybody's Accessory Co., Columbus, Ohio, in the form of a partnership and will deal in a full line of supplies. The store is located at 118 East Long street.

Hamey-Eich Co., Columbus, Ohio, Dort distributors in central Ohio, has moved from 166 North Fourth street to 200 East Gay street.

Powers-Van Billiard Co., 834 North Broad street, Philadelphia, has been appointed distributor for the new Portage tire manufactured by the Sieberling Rubber Co., of Akron, O.

Lexington Motor Co., 851 North Broad street, Philadelphia, distributer of Lexington and Gardner cars, has obtained possession of the building at 4624-4628 Chestnut street, which it will remodel and equip as a service station. The building contains 20,000 square feet of floor space on one level. A parts department will be installed.

The Killy Motor Co., Omaha, announces acquisition of sales and distribution of the Franklin car in the Omaha territory.

Miller-Toher Automobile Co., 510-514 Main street, Davenport, Iowa, has taken general agency for the Cleveland Six in seven counties in eastern Iowa and western Illinois. C. J. Toher and Vincent Miller head the concern.

Frank Booghier, formerly of the W. A. Kelley Ford Agency, Springfield, O., and Virgil L. Circle, formerly of the George W. Higgins Company, have secured the agency for the Durant motor cars in this section and have opened an office and display rooms in the H. G. Root Company building in Washington Place. They have a four and a six cylinder model Durant on display.

Conn. Motors, Inc., with sales station at 1104 Chapel street, New Haven, Conn., has been recently formed and will handle the Peerless eight in New Haven, and New Haven County, and Geo. D. Knox, for many years Peerless distributor at Hartford, is president and general manager of the new company.

Motor Service Garage, Perry, Ia., was destroyed by fire July 1 with loss of $40,000. Thirty-one automobiles and trucks in storage were ruined.

Hannan-Odell-Van Brunt, Inc., is a firm organized at Omaha, Neb., to handle the Ford and Lincoln cars. The company has taken over the lease of the Western Motor Car Co. on the Building at 3002-3010 Farnam street.

The commodious sales plant at 1724 O street, Lincoln, Neb., which was formerly occupied by J. H. Markel, Dodge distributors, has been leased by Will F. Hitchcock as Paige and Jewett headquarters for this company.

Southwest Motor Co., Dallas, Texas, distributors in North Texas for the Wills-Sainte Claire cars, has changed hands. The controlling interest in the company has been purchased by John P. Neece, formerly of Mexia.

Drexel Motor Co., Houston, Texas, has taken over the Jordan lines in the Houston territory.

Clemens Automobile Co., Des Moines, Ia., distributors of Overland and Willys-Knight cars, has appointed William S. Black manager of their service department.

W. D. Kelly, who was for several years plant manager of the Oakland Motor Car Co., Pontiac, Mich., and G. Roy Williams, formerly with Oakland and recently a member of the Michigan Nash Distributing company, Detroit, have formed an agency here to handle Nash, Willys-Knight and Overland cars. They will establish also a service garage and accessory shop.

Barney Habel Auto Co., Pontiac, Mich., agents for Maxwell, has leased the Franklin-Jacobs garage, a new building, and moved in. The Franklin-Jacobs company will occupy temporary quarters.

Guaranty Motors Corp. nas taken over recently the agency in Kansas City for the Mitchell Motor car.

Allison Rood Co., Lincoln dealer in Chicago before the purchase of the Lincoln company by Ford, has added the entire Ford line of cars, trucks and tractors, and continues to handle the Lincoln.

With the resignation of F. J. Bury, A. C. Scott announces a change in the corporate name of the Packard agency at Omaha from Scott-Bury Motor Car Co., to Scott Motor Car Company. Scott is president of the company.

George W. Canterbury, Inc., of 967 Commonwealth Ave., has taken over the sale of Winton cars in the Boston territory.

Potter-Diesinger Motor Co., Inc., Philadelphia, distributor in this territory of the Fiat Italian, and the Elgin cars, of which A. J. Diesinger is vice-president, is holding a liquidation sale, announcing its retirement from business.

Don Miller, who formerly owned half interest in the Rice-Miller Motor Co., dealers in Ford and Lincoln cars, has purchased the interest in the company of R. P. Rice. The corporation is now known as the Don Miller Motor Co. Rice is continuing with his own establishment, the R. P. Rice Motor Co.

R. S. Ledsinger and M. R. Twitty, of Brunswick, Ga.; P. S. Bird, of Draien, Ga., and J. E. McMee, of Jacksonville, Fla., have purchased the Ford Sales Agency of Valdosta, Ga., from G. G. Hearn, who has operated the business for several years.

W. J. Daniel, Harry Daniel and L. H. Reynolds have organized the Daniel Auto Co., at Eastman, Ga., starting in business the early part of July as Dodge distributors in five counties surrounding Eastman.

The Keystone Tire Sales Co. has opened a new branch at 77 Edgewood avenue, Atlanta, handling the Keystone and Metropolitan cord tires and Keystone tubes. It is branch No. 16 of the Keystone Tire and Rubber Co. M. B. Kleinberg, of Atlanta, is manager of the new branch. D. C. Shepherd is sales manager for this territory.

The Nebraska-Moon Motor Co. is a new organization which has just opened at Lincoln, Neb., for the distribution of Moon cars in the entire state. The members of the new company are: J. L. Kennard, G. C. King and W. C. Schaus.

Lymburners Motors, Inc., have established a showroom in Montreal, at 3 Park Avenue, and have secured the distribution in Montreal territory of the Stephens Salient Six. A sales campaign is now being arranged.

Jordan Co. has opened a showroom for the display of the Jordan in Montreal at 2438 Park street.

Dominion Motors Limited, Halifax, is distributing the Nash in Halifax territory. A service station for the Nash is also maintained by the Dominion Motors.

A TRAVELING SAMPLE ROOM

SPRINGFIELD,Ill., July 17—A unique sales truck, built especially for the Myers Brothers Drug Co., of St. Louis, attracted much attention at the state convention of druggists held here. In former years, salesmen for drug houses carried seven to eight huge trunks which were handled by the railroads and then opened at the sample room of the hotels. This expensive and unsatisfactory process has been eliminated by the pharmacist's truck which carries show cases and shelving with an aisle down the center. The patrons find all the samples conveniently displayed upon the truck, the dealer simply stepping from his place of business to the truck as it stands in front.

The length is 12 feet, width five feet, and height six feet. A Dodge chassis was fitted with a body manufactured by the Anheuser-Busch company of St. Louis. These trucks will enable a salesman to cover an extensive territory in much less time than was the case under the old system by railway trains. In addition, it is possible to call upon many drug stores in the smaller towns which were disregarded in the past.

July Tire Production at Pace Attained in Late June

Tires Being Turned Out at a Rate of 105,000 a Day

AKRON, O., July 15—Production of tires during the first part of July was maintained at the pace attained during the latter part of June in spite of the predictions made during the early part of the previous month that decreases in production might be expected during the early part of July.

The manner in which sales of new automobiles and used cars continue throughout the United States and foreign countries has been a surprise to the rubber industry which to a large extent depends upon sales to the manufacturers of original equipment tires for volume of business.

It is reliably estimated that production in the Akron district continues at the rate of approximately 105,000 tires a day, but no increases with the exception of smaller ones in the smaller companies have been registered during the past three weeks.

Goodyear Tire and Rubber Co. production has crept above the officially announced total of 26,000 tires a day, largely because of the sale of the low priced cord tires. Firestone Tire and Rubber Co. is maintaining an even keel at 26,000 tires a day. The Miller Rubber Co. is operating at the peak of its history at very close to 7,000 tires a day while the B. F. Goodrich Company, which for a time was behind its competitors, has now reached a production stage comparable with its competitors. The fact the Goodrich has not taken any original equipment business and is depending almost entirely upon dealers' business has not made possible the volume production which has been registered in some of the other large plants.

CARNIVALS BUY TRACTORS

CHICAGO, July 15—The American Carnival Assn., promoters of carnivals in cities and towns throughout the country, during the summer, have purchased and placed in operation, 14 tractors of different makes which propel the various rides used in the traveling pleasure parks. On the road, the tractors are used to haul the heavy things.

CANADIAN STEAM CAR CO.

WINDSOR, Ont., July 15—The city is to have another automobile industry and will enjoy the distinction of being the first city in Canada to turn out steam cars. The name of the new concern is Windsor Steam Motors, temporary offices for which have been opened at 6 London Street East. The company is a branch of the Trask Detroit Steam Car Co. of Detroit.

BUSINESS NOTES

The new building being erected at Twenty-eighth and Harney streets, Omaha, Neb., for the Auto Electric Service Co. will be ready for occupancy about Aug. 10. The building is of brick and steel construction and will cost approximately $55,000.

New Departure Mfg. Co., Meriden, Conn., has recruited a staff of workmen to put the Meriden plant of the company in readiness for operation. The factory buildings were completed two years ago at a cost of about $2,000,000. The company has taken on 800 additional workers at its Bristol plant.

The Witwer Battery Co. has been organized at Danville, Ill., and will manufacture and deal in electrical batteries and equipment. Capital stock has been fixed at $50,000. The plant will be located at 630 St. Louis street.

The first of the four buildings to be constructed in Kansas City by the White Co., of Cleveland, will be ready for occupancy in four months. The building is to cost $100,000 and is being built on ground acquired by the White company two years ago at a cost of $57,000.

Auto Accessory Mfg. Co., 223 South Main st., Hannibal, Mo., has been organized to manufacture a line of automobile accessories. H. W. Leavitt is manager.

Phillip H. McKinley and Arthur W. Wolf, publishers of "Motortrade," Kansas City, have purchased the "Garage Journal," the official publication of the Garage Owners Assn., and will continue it as a special section in "Motortrade."

American Automotive Machine Sales Co. has been organized to take over the sales of the American boring and grinding machine, a new invention, manufactured by the American Automotive Machine Company.

Tyree Auto Repair Mfg. Co. is a new incorporation which will manufacture and deal in automotive parts, machinery and accessories. Headquarters are at 814 W. 33rd st., Chicago.

Peerless Auto Supply Co., Kansas City, has obtained a 10-year lease on a new building under construction at Twenty-fifth and Penn sts. It is said that the approximate rental will be $30,000. The new building will be ready for occupancy in August. The Peerless Auto Supply Co. is the successor to the Peerless Manufacturing Co. The concern is jobber and distributor of automobile supplies.

Kansas City Tire and Rubber Corp., reorganized by the purchasers as the Rubber Manufacturing Corp., is again in the business of manufacturing tires and tubes. Production averages 650 tires a day. P. E. Werner is president. The original company went into the hands of the receivers more than a year ago.

A 500 per cent increase in the production of Cornhusker tires between 1920 and 1922 is the record made by the Nebraska Tire and Rubber company, under the management of W. W. Wuchter. This company is now producing tires at the rate of 1,000 daily, working three eight-hour shifts, employing about 225 men.

The original building of the Firestone Tire & Rubber Co., at Akron, O., which has recently been devoted to the manufacture of steel rims, will be sold following the removal of the rim manufacturing department to a new factory recently built for the Firestone Steel Products Co.

Weldene Service Shop, Davenport, Ia., has occupied larger quarters at 210 Ripley street, extending its welding service for crankcases, water jackets and cylinders.

Peerless Co., Columbus, O., has been chartered with a capital of 500 shares, no par value designated, to operate a garage, sales agency and rental agency.

J. T. Tractor Co., Cleveland, has been chartered with a capital of $20,000 to deal in tractors and farm power implements. The place of business is at 920 Guardian Bldg.

Douglas Repair Shop, 2024 Douglas street, Omaha, Neb., was partially destroyed by fire on the evening of July 7.

The Automotive Sales & Service Co., of Atlanta, after operating for five years as a factory branch for Splitdorf products, has been organized as a separate company and has taken over the distribution of the Splitdorf line in the entire southwest. S. D. Katz heads the new company, which covers eight states. Products of the Wire Wheel Corp. and Benzer lenses are also distributed in the southeastern territory by the Automotive Sales & Service Co.

Spence Auto Co., of Omaha, announces the opening of garage No. 2 at 2556 Leavenworth street. This building was formerly occupied by the Universal Motor Co.

White Way Motor Co., of High Point, N. C., has been chartered with a capital stock of $100,000 authorized, by H. A. White and others.

Consigny Motor Truck Co., distributors of the Republic trucks in Iowa, has announced a change in the firm name. The new name is the Gibson Motor Co.

Construction of the H. W. Neumann Machine Co. building, Fifth and Harrison streets, Davenport, at a cost fo $30,000, is rapidly nearing completion. The Neumann company will devote a display and sales room 30x50 feet to its Jordan and Auburn cars. Remainder of the 6,000 feet of floor space will be used for service department work.

W. C. Sheehan and C. A. Lang have formed a corporation at Omaha under the name of Sheehan Construction Co. The authorized capital stock is $75,000. The business of the corporation will be a general automotive line, building truck bodies, buying and selling automobiles, general repairing, and accessory supplies.

Clinton Tire Co., of Clinton, Ia., has secured site for erection of a large tire building and retreading plant to be in operation January 1, according to announcement of Frank Gottstein of Des Moines. Associated with him in the concern is his son, Joseph. The plant will represent an investment of between $500,000 and $750,000 and will employ a force of from 150 to 200 workers.

B. F. Goodrich Rubber Co., Lincoln, Neb., has reopened its Lincoln branch, having leased a location at 1128 P street. The branch was closed the latter part of 1921. C. L. Rathbun will again be the manager.

Universal Garage, St. John, Canada, has been established as a Ford service station. The proprietors of this garage, Ryan Brothers, formerly conducted the St. John Garage on Duke street.

MINNEAPOLIS MOTOR ROW WIDENED

MINNEAPOLIS, July 17—One of the city growth developments that has a close relation to the motor car business locally is the widening of streets with a look forward to the time when the population will be doubled and traffic problems of that period may be anticipated when property is cheaper. The motor car center has shifted often in the 20 years of the development of the trade, but the widening of Harmon Place seems to permanently settle that street, which is parallel to Hennepin Avenue, a main thoroughfare, as an avenue to be lined with automobile and accessory stores. Several years ago pioneers in the business settled on Harmon Place, because it was a main highway to southern city points and to Lake Minnetonka. Their foresight is justified, among them being the Northwestern Automobile Co. and the Twin City Motor Car Co. and the Fawkes Auto Co.. This street has just been widened 20 feet so that it is now 80 feet wide between street curbs, seven blocks long.

MAIBOHM SALE CONFIRMED

TOLEDO, July 18—Federal Judge Killits has confirmed the sale of the property of the Maibohm Motors Co. to a creditor committee which has incorporated the Arrow Motors Co. as a successor. Minority creditors who did not come in under the plan for acceptance of preferred stock in the Arrow company will be given until July 20 to prove their claims. H. C. Maibohm, former head of the Maibohm company, is included in this group.

Tire Development Being Revived; Many New Designs

Goodyear, India and Firestone Among Those to Announce Other Styles

AKRON, O., July 17—Tire development which was held up first by the war, then by the period of unprecedented production expansion and later by the industrial depression has been revived and new tires and new ideas in the tire field are following one another rapidly in the rubber center.

During the first part of the month the Goodyear Tire and Rubber Co. announced the production of a smaller diameter tire for buses and trucks.

Announcements of extending the cross rib tire line to bus and truck sizes followed the announcement of the new line. Innovations in the form of using the Goodyear cross rib design upon cushion tires and several new cord sizes for buses and trucks completed the Goodyear announcements.

At the same time the Firestone Tire and Rubber Co. announced that a new line of small cord tires, especially designed for light trucks and buses has been developed and will be placed on the market in the near future.

The India Tire and Rubber Co. announced that while the company is now making a smaller cord tire to follow the Goodyear cross rib tread, plans are being made for the highest quality tire the company has ever produced and that production on the new tire will be started in several months.

The Goodyear smaller diameter tire is intended to bring the body of both buses and truck closer to the ground and facilitate loading and unloading and also to decrease sideswaying of the vehicle and also to decrease the danger of overturning. The company has made arrangements with several manufacturers to use the tire as new equipment. Changes in body and axle construction are necessary before the new tire can be used.

FRENCH COMPANY'S BIG DEFICIT

PARIS, July 14—A loss on the year's working of more than 15,000,000 francs will be shown on the balance sheet of the Bellanger Automobile Co. to be presented to the shareholders in a few days. This loss has to be added to a deficit of 4,342,506 francs for the preceding year. In addition to two very high-grade automobiles of its own construction, the Bellanger company is marketing a cheap car assembled in Paris with parts imported from Detroit. Benjamin Briscoe was responsible for the introduction of this scheme and for the shipment of the American parts. In addition to its automobile branch Bellanger is building Diesel engines and has aviation contracts in hand.

CONCERNING MEN YOU KNOW

W. R. Huntington, well known along automobile row at Omaha, Neb., is now associated with the Jones-Opper Co., as retail salesmanager.

Walter L. Daly, vice-president and director of sales and advertising of the Columbia Motors Co., announces the apointment of David J. Willoughby as salesmanager of the Columbia Motors Co.

Fred O. Clough, who was in the automobile business at Omaha, Neb., for a number of years and zone manager for a number of factories, has resigned his position with the Stephens factory to join the Mid-City Motor Co. as wholesale manager of the Maxwell car.

W. L. Sullivan, formerly associated with the advertising department of the Oakland Motor Car Co., Pontiac, and later in the retail field in Washington state, is now connected with the Hudson-Essex agency at Mt. Clemens, Mich.

Eddie Lyons, Oakland Motor Car Co., Pontiac, returned from California to pilot the Oakland 6-44 model entered in the Michigan Pikes Tour around Lake Michigan.

Edward Welchans, formerly engineer for the American Bosch Magneto Corporation, has become chief engineer for the J. & B. Manufacturing Co., of Pittsfield, Mass.

Edward S. Jordan, president of the Jordan Motor Car Co., was one of the speakers before the "Hundred Club" of the Addressograph Co. at its convention July 7 at the Drake Hotel, Chicago.

Joseph Ewing has been appointed director of sales of the Martin-Parry Corp. and George Hotte has been appointed his assistant.

B. P. Strickland, who was formerly connected with the Atlanta, Georgia, branch of the Quick Tire Service, Inc., is now manager of the Kansas City branch of the same corporation.

Clyde E. DeBolt has resumed his former position as salesmanager of the Schillo Motor Sales Co., Mercer and Templar distributors in Chicago, after having been away for a year and a half.

L. I. Ris, formerly with the Star Rubber Co., of Akron, has returned to Star as eastern district manager. Ris has charge of Star's sales for New Jersey, Delaware, Virginia, New England and Eastern New York and Eastern Pennsylvania, with headquarters at New York.

George Pearson, Jr., has been appointed exclusive California distributor for the Deglarescope lens. He will open offices in both San Francisco and Los Angeles. He recently resigned as salesmanager of the Union Motor Co., Los Angeles.

Chas. S. Rieman, president of the Elgin Motor Car Co., Chicago, is president of the Chicago Aeronautical Bureau under whose auspices an aircraft exhibition and Aeronautical Congress will be held at Chicago Aug. 4 to 13. Contests of airplanes and hydroairplanes will be held in Grant Park extending along the lake shore.

M. S. Mentzer, formerly in the automobile business in Atlanta but who left the city some months ago to become branch manager for the Studebaker company at Buffalo, N. Y., has returned to Atlanta as manager of the Studebaker branch, succeeding S. M. Piper, who died in June.

James McEvey, formerly in charge of the Detroit offices of the legal department of General Motors Corp., has been made director of the patent section of the advisory staff at Detroit.

George Vogel is the new manager for the used car department for the Tri-State Motor Company, Kansas City, Mo. Vogel was, at one time, manager of the used car department of the Willys-Overland Co. and later was connected with the R. & V. Knight Co. here.

A. S. Nelson is the new sales manager for the McFall Motor Co., Kansas City, Mo. He was formerly with the Gregory Motor Co. and the Kirkland-Craven Motor Co. Just recently he was with the Don Hogan Motor Co. of Denver.

Ford to Double Production of Cars at Canadian Plant

DETROIT, July 18—Ford Motor Co. of Canada, Ltd., has paid $1,000,000 for lands adjoining its Border Cities plant on which it is proposed to erect structures which will enable it to double its present capacity of 250 cars daily. An ultimate 1000 cars a day production is contemplated, according to W. R. Campbell, vice-president in charge of operations at the Canadian plant.

Plans for the extension of the plant activities have been worked out in conjunction with Henry Ford, president of the Canadian company. Engineers are now preparing plans for the buildings which will include machine, forge and body shops, and foundries. Other buildings will be added later which will provide for the manufacture of all parts and equipment used in the Canadian Ford car.

The new property provides a river frontage of 2000 feet. According to Ford, the establishing of a tractor plant is not contemplated in conjunction with the extension of car manufacturing facilities. Tractor building in Canada is contingent upon the locating of a water power site.

WOMAN GARAGE PROPRIETOR

COLUMBUS, O., July 15—Miss Esta M. Mayhugh is at the head of a garage and repair shop, among the best in Columbus. The business is operated under the name of E. M. Mayhugh and a storage capacity of about 90 cars is always filled. After completing school she took the position as bookkeeper for the Motor Hire Co., and from that start entered the garage business 5 years ago at 70-82 Parsons avenue. The company specializes in the sale of used electrics and she has built up an extensive patronage. The motto of the concern is "Good Service is Our Best Advertisement." She enjoys driving and uses a four-passenger racing type Stutz in going about.

NOMA APPEARS IN CHICAGO

CHICAGO, July 15—The Noma Motors Corp. of New York has begun to market the full line of Noma cars in the Middle West through a Chicago distributor. Heretofore the Noma cars have been sold only in limited sections of the East.

The Chicago distributor is Noma Motors of Chicago, a Division of Tivoli Motors Ltd., and has opened new offices and sales rooms at 2437 South Michigan avenue. E. E. Glatt is president and H. R. Crume is general salesmanager. The distributor's territory includes 14 Mississippi Valley states in which dealers are being sought.

The price list is Speedster, $2400; 4-passenger, $2500; 6-passenger, $2500; Coupe, $3500; Sedan, $3500.

BUS OWNERS TO MEET

COLUMBUS, O., July 18—Arrangements are being made for the annual meeting of the Ohio Bus Owners' Assn. which will be held in Columbus some time in August. The association was formed about a year ago. R. E. McCollum of Columbus is president and C. H. Frazer of Mt. Vernon, secretary of the organization.

State Assumes Sanitary Control of Tourists Camps

Iowa Board of Health Prescribes Rules Made Necessary by Growing Congestion

DAVENPORT, Ia., July 15—Automobile tourists camps in Iowa have grown to such proportions that the state board of health has taken steps to provide sanitary control measures and regulations for each one, whether private or municipally owned.

Dr. Rodney P. Fagan, secretary of the state board, after weeks of study of various camp sites has issued detailed rules, providing that:

Water of approved quality be piped in convenient places. In case of unpiped water, signs must be placed directing to safe water and under no condition may water be dipped from spring, barrel or other receptacle.

Sample of all drinking water must be sent to state health laboratories for health certification.

Fly-proof building with flush toilets must be provided and care taken that it be kept clean at all times. Where such toilets are not possible, cement pit with fly-proof house, must be constructed.

Garbage must be kept in covered metal containers distributed throughout the camp grounds. Cans must be kept clean inside and recommendation is made that they be burned out weekly or unslackened lime sprinkled over the sides and bottom.

Competent caretaker must be employed whose duty it is to see that grounds are kept in sanitary condition.

DEALERS' BILLS FAIL TO PASS

NEW ORLEANS, July 15—The highway bill, which would have made some changes in the levy of license taxes on motor cars and the license plate bill, which would have given the dealers an adequate number of duplicate license plates to take cars out for demonstrations, both died on the calendar at the close of the most disorderly session of the legislature ever held in Louisiana. The disorder was the direct effect of a filibuster against a bill to prohibit betting on horse races. While the governor has said nothing, the indications are that he will call a special session of the legislature and that legislation affecting dealers and the levy of the motor car license taxes will be included in the subjects of the call.

MEMPHIS DEALERS' SHOW

MEMPHIS, Tenn., July 15—The annual automobile show under the auspices of the Memphis Automobile Dealers' Association will be held here at Tri-State Fair Grounds, Sept. 23 to 30. The dealers are planning an elaborate show and expect to establish a new attendance record. H. W. Osoinach is secretary of the association.

The READERS' CLEARING HOUSE

Questions & Answers on Dealers' Problems

Responsibility in Case of Fire While Filling Car's Gas Tank

Q—I am employed in a garage where it is a part of my duties to sell gasoline from a pump on the curb. A few days ago a .....car drove up and the owner left the engine running. The gas tank was overfilled and ran over the engine. The owner stated he hoped the thing would burn up so he could get his insurance. If the car started to burn would it be my fault or the owner's fault? Should a car be filled while the engine is running?

A—Your proposition in law is one of negligence. It is your duty to see that the engine of a car is not running before you fill the tank with gasoline. If so, then you are guilty of negligence, for which you or your employer, or both, might be held liable for any damages resulting.

If the running of the engine during the filling process is the cause of a fire and damage, then the proposition is one of determining whose duty it is to see that the engine is stopped before filling the tank. In your case it appears that both you and the car owner would be guilty of negligence, and if so, there could be no recovery against you for the owner, who would have the right of action for his loss, would be held guilty of contributory negligence. In other words, in case of suit, you could defend by showing the owner contributed to the negligence by letting the engine run with the knowledge of the possible results.

This brings up another point that might be involved, and that is, whether handling of gasoline than a car owner, and therefore it becomes his duty to first require the engine to be stopped before filling. This appears to be the better rule, and most dealers do, as a matter of fact, require the engine to be stopped.

There is yet another element that might enter into such a case. Since gasoline has become almost as non-inflammable and non-explosive as kerosene, such that in the ordinarily heated engine spilling gasoline would not catch fire, the negligence might not be due to filling while an engine is running, but due to an overheated engine, etc., in which case the negligence would rest wholly on the part of the car owner. But this is speculative on facts and conditions in the individual case.

The only safe course is to require the engine to be stopped while the tank is being filled.

The Readers' Clearing House

THIS department is conducted to assist dealers and maintenance station executives in the solution of their problems.

In addressing this department, readers are requested to give the firm name and address. Also state whether a permanent file of MOTOR AGE is kept, for many times inquiries of an identical nature have been made and these are answered by reference to previous issues.

Inquiries not of general interest will be answered by personal letter only. Emergency questions will be replied to by letter or telegram.

Addresses of business firms will not be published in this department, but will be supplied by letter.

Technical questions answered by B. M. Ikert, P. L. Dumas and A. H. Packer; Legal, by Wellington Gustin; Paint, by G. King Franklin; Architectural, by Tom Wilder; Tires, by a Practical Tire Man; General Business questions, by MOTOR AGE organization in conference.

What Caused the Explosion?

Q—After working over an old model Franklin car, equipped with an Eisemann magneto I had it working nicely, except one spark plug which was not firing. I drove car a few miles and came back at which time the engine was idling. The engine had idled for a few moments when it started to spit a few times through the carbureter and just about that time there was an explosion that about shook the earth. When the smoke cleared away I found it had occurred in the crankcase and bursted it to pieces, but the engine was still running nicely after the explosion. The crankcase was filled the day before with new extra heavy airplane motor oil. With this information can you possibly tell me any reason for the explosion?—The Crescent Auto Repair, Pueblo, Colo.

A highly probable cause of this crankcase explosion would be the presence of a hole in top of the piston head. Oftentimes in the machining of light walled pistons the center hole in the closed end of the piston is center drilled to a depth which leaves very little material. With a small hole in the head of the piston it would be possible to deposit considerable explosive vapor in the crankcase and at the same time the engine would tend to operate while idling although it would not function on that cylinder under a load. We would suggest that you remove all of the pistons and examine them carefully especially at the piston head for holes through the top.

LOOK FOR CAUSE OF FRICTION AS REMEDY FOR OVERHEATING

Q—Supply information as to the probable cause of overheating of a Hudson model 7-O. Timing is perfect, brakes are free and radiator new. Water is good also pump and shaft and the car has plenty of power. At about 30 to 35 m.p.h. it boils very badly. We are considering installing a Stromberg carbureter.—Shaffer Oil & Refining Co., Drumright, Okla.

Granting that the cooling system is in perfect condition and that the radiator is not clogged we are inclined to believe that the cause of the trouble may be due to pistons that are improperly fitted. You do not state whether this engine carries the original piston equipment. If it does not we believe that it would be of value if you were to remove the cylinder block and gage the pistons as to clearance especially at the top. The clearance of the piston at the upper ring land should be not less than .008 and at the second ring land not less than .006.

The skirt clearance should be not less than .0035. Many times oversize pistons are installed in an engine and they are not properly relieved at the top ring land and when the engine comes up to normal operating temperature the top of the piston expands and creates considerable friction between piston and cylinder wall which produces overheating.

It is apparent that the cause of the overheating lies within the engine itself and we would work along the line of eliminating every point which might cause internal friction and we believe that the pistons are the first point which should be given attention.

A LITTLE THEORY CONCERNING SPARK PLUG SIZES

Q—Advise which spark plug will stand up best under a high speed high compression motor, a seven eights or metric plug. —Main Garage, Schererville, Ind.

The Continental practice and present day American racing practice for plugs in high speed high compression engines is to expose as little surface as possible to the heat of combustion. Following this line of reason it would seem that the metric plug would give considerably better results than the seven eights plug. In high compression motorcycle engines and in all aviation engines which are of the high compression type the metric size plug is used for this reason. The type of insulator used has considerable to do with the performance of the plug in an engine of this type also. Mica will stand considerably more heat and higher compression but is generally addicted to preignition whereas porcelain although it may not withstand the heat to such an extent as will the mica, will be considerably freer from preignition.

Good Two Story Layout for 50 Ft. Inside Lot

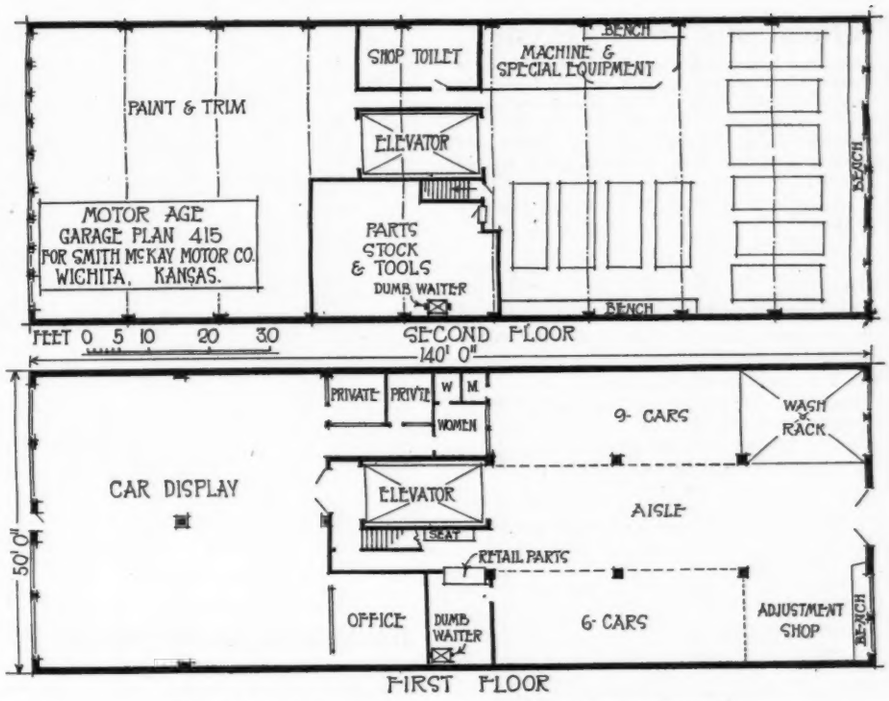
PLAN NO. 415

We would like to have you furnish tentative plans for a salesroom 50x140 ft., two stories. The location is an inside one being about in the center of the block. We would like to have it designed to show a salesroom of approximately 50x50 ft. with general offices located just back of the salesroom and used car salesroom back of the offices. At the rear we propose having our light service work done but the main shop and parts department will be upstairs.—Smith-McKay Motor Co., Wichita, Kansas.

The only objection to this layout is the necessity of using artificial light in the offices and the center of the lower floor. This objection may be counteracted by the use of attractive lighting fixtures which will shed a warm glow and make the artificial light an asset as far as appearances are concerned. The office force which must work in this light continuously will doubtless find fault but it is a condition often found in cities.

The small parts room on the main floor is for the small necessities most frequently called for and is connected with the main stockroom on the second floor by a dumb waiter. If there is not enough business in parts to warrant keeping a clerk on the main floor this space may be used for some other purpose and customers sent directly to the main stockroom on the shop floor.

The elevator location is, we think, especially good. It gives a straight entrance and a straight exit to the rear door and it divides the upper floor into two parts, one of which may be used for repair shop and the other for all the other departments such as trim, paint, electrical and battery.



This is a good example of a convenient elevator approach

Architectural Service

IN giving architectural advice, MOTOR AGE aims to assist its readers in their problems of planning, building and equipping, maintenance stations, garages, dealers' establishments, shops, filling stations, and, in fact, any building necessary to automotive activity.

When making request for assistance, please see that we have all the data necessary to an intelligent handling of the job. Among other things, we need such information as follows:

Rough pencil sketch showing size and shape of plot and its relation to streets and alleys.

What departments are to be operated and how large it is expected they will be.

Number of cars on the sales floor.

Number of cars it is expected to garage.

Number of men employed in repair shop.

And how much of an accessory department is anticipated.

LEGISLATION AGAINST THE SHIMMY

Q—We have a 1920 model Stephens roadster which after it attains a speed of 20 m.p.h. begins to "shimmy." We have tried everything we know to try to remedy this trouble and have asked several other good mechanics. No one seems able to find the trouble. We have replaced any parts which we thought might be the cause but could not remedy the trouble.—Harry Frech, Carrollton, Ill.

The trouble referred to can be eliminated by the installation of a special eccentric bushing in the steering gear housing. This bushing can be secured from any large Stephens distributor, or we would advise that you communicate directly with Mr. R. C. McDowell, Att., Service Department, Stephens Motor Company, Freeport, Ill.

UNITS OF LIGHT REGAL CAR

Q—We have a four cylinder light Regal touring car using a 30x3½ tire, the only number we can find is on the front frame member which is stamped E1149. We would like to know who manufactured the following and where parts could be obtained for same: Engine, transmission, rear axle and differential, size of piston rings used.—E. L. Chatfield & Son, Gravette, Ark.

This car was known as the model E and carried a Port Huron engine. The transmission was manufactured by the Covert Gear Co. The rear axle and differential by the Peru Auto Parts Co. The size of the piston rings was 3⅜ by 3/16. Both the Regal company and the Port Huron Engine Co. have discontinued operation. Information as to where you may obtain parts for this car will be supplied by letter.

NOT ADVISABLE TO REVISE WILLYS-KNIGHT

Q—What is the peak of the h.p. of the Willys-Knight engine model 84, 4⅛ by 4½?

1—This engine shows its maximum hp. at 2,100 r.p.m.. At this speed the brake hp. is 52.

2—What is the clearance of sleeves when replaced?

2—The clearance between sleeves should be .002. The piston to sleeve clearance should be .006 to .009.

3—I intend to install Dowmetal or Kant-Skore pistons, can we change the timing of this engine any way to increase the power?—Fred Blossom, Sarasota, Fla.

3—It is not advisable to attempt to change the timing on this engine, as it will not increase the power and, generally speaking, will show a decrease in performance. The Knight engine does not readily lend itself to changes in order to increase its performance, and we would recommend that you leave the engine substantially as it is.

ENGINE EQUIPMENT OF MOON AND COLUMBIA

Q—In MOTOR AGE about January 20, 1922, there appeared a photograph of rear spring suspension of a light car, having ¼ elliptic springs, fabris universal joints and no torque tube or torque arm. What make car was this?

1—The illustration referred to was the rear axle and chassis assembly of the Gray car.

2—How is the torque action taken care of on this car?

2—This is a Hotchkiss type of drive, and the springs are called on to take both the torque reaction and the driving strains.

3—Is the Lycoming Motor Corp. making either a 3 or 5 bearing crankshaft engine?

3—Our specification list shows only a two bearing crankshaft listed as being manufactured by the Lycoming Motor Corp. If a later model of engine has been announced it has not been listed in the latest specifications issued by this magazine.

4—Do the Continental motors model 8-A six cylinder, 3¾ by 5 or the 6-Y six cylinder 3⅛ by 4¼ have silent chain driven camshafts or are they gear driven?—Fay Wood, Elkhart, Ind.

4—The Continental 6-Y engine as used in the Columbia and Moon cars uses silent chain drive on the camshaft and generator. The model 8-A six cylinder as used by Paige has metal gears for driving the camshaft.

Questions On a Haynes

Q—We have come into possession of a model 37 Haynes chassis which formerly had a sedan body. This body however was burned off before we came into possession of the car so that there are a number of points on which we would like information.

1—What year was this model Haynes built?

1—1916 and 1917.

2—This car has wire wheels, what size tire should be used?

2—The regular size tire was 34x4 and the oversize 35x4½. On this particular model the wire wheels were special as wood wheels were standard.

3—What would be the maximum speed of the bare chassis?

3—Approximately 60 m. p. h.

4—What is the maximum h.p.?

4—57 h. p.

5—What is the bore and stroke of this engine?

5—3½ by 5.

6—How much oil should be carried in the engine base?

6—Six quarts.

7—What make of ignition was used on this car? Did the distributor shaft revolve clockwise or counter clockwise?

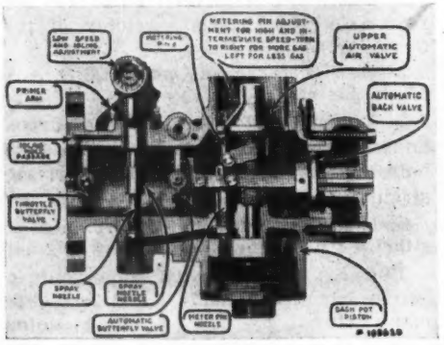
7—Remy ignition was used. According to information available the shaft rotated clockwise looking down on it from the top. You can check this however by turning the engine over by hand and observing the way the shaft turns, that is, if the ignition outfit was not destroyed in the fire.

8—What is the approximate gasoline and oil mileage obtained from this car?

8—Gasoline, about 12 miles per gallon. No definite information obtainable on the oil mileage as this varies considerably with the condition of the engine.

9—What make of carbureter was regular equipment? Show adjustments of same?

9—The Rayfield Model M carbureter was used, sectional view of this carbureter is shown below.

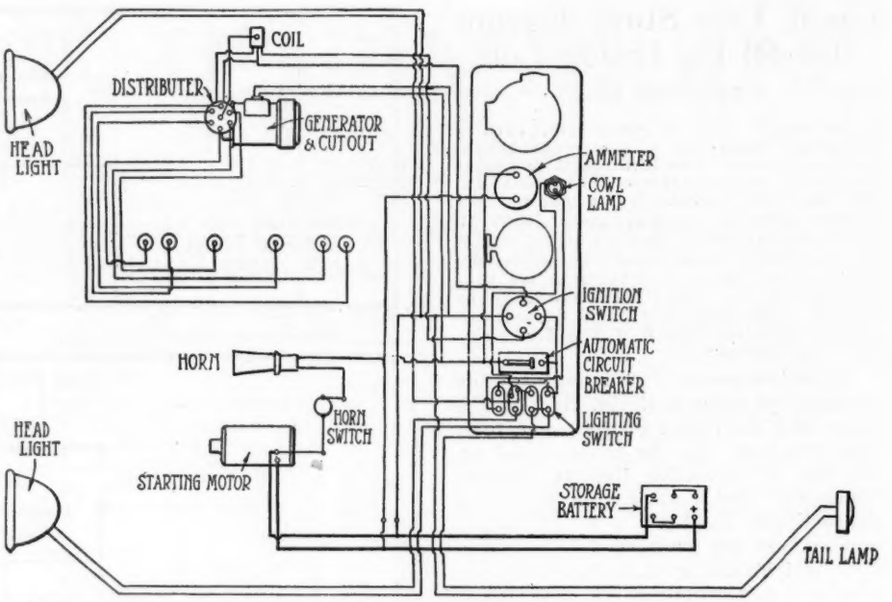


The adjustments are as follows:

The model M. Rayfield carbureter has two adjustments, one for low speed and one for intermediate and high speed. These adjustments cannot change after being set as they are positively locked. Always adjust carbureter with dash control down. For low speed, adjustment should be turned to the right or left as required until engine runs properly at low speed. Allow engine to become fairly heated, then make final adjustment by turning low speed screw to the left until motor slows down; then turn to the right a notch at a time until engine idles smoothly. If engine does not throttle low enough turn stop arm screw to the left until it runs at the lowest number of revolutions desired. The high and intermediate speed adjustment is made accessible by removing the hot air elbow from over the main air valve. Do not move the high speed screw more than ⅛ turn at a time. Turn it to the right for a richer and to the left for a leaner mixture. This setting being very effective, will greatly determine the fuel economy; therefore, make sure that it is set as lean as possible, still retaining good acceleration.

10—Publish wiring diagram.—J. H. Wynn, Gary, Ind.

10—Wiring diagram is shown above.



WIRING DIAGRAM 1917 HAYNES MODEL 37

HOW TO MAKE ELECTRIC OVEN FOR SOFTENING BATTERIES

On page 45 of the May 11 issue of Motor Age there appeared a request for information in regard to building an electric oven for softening battery compound. Information as to a suitable way of making such an oven has been kindly supplied to us in a letter from Mr. Earl R. Witzel, Instructor in Applied Electricity at University of Wyoming. As this letter gives all necessary details it is printed herewith.

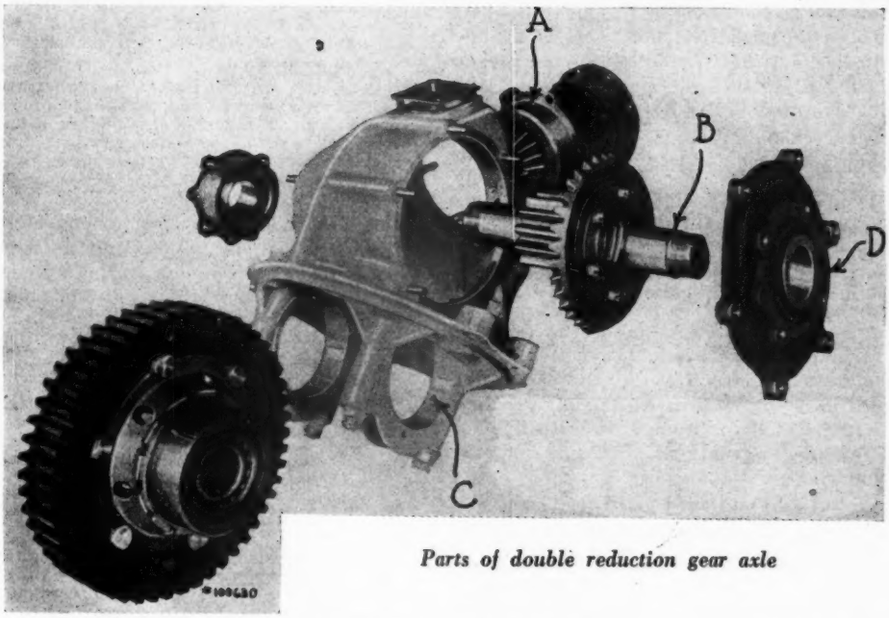
I have used an electric oven and steam outfits for three years and all have their advantages and disadvantages. For my electric oven I used four 250-watt Cutler-Hammer space heaters and the box was large enough to accommodate four Ford batteries. The heaters were set horizontally about three inches above the batteries and three inches below the top of the box which was asbestos covered, but no asbestos was used on sides or bottom. The door was on one side.

For one or two batteries, only one pair of heaters was used. Care should be used to put some asbestos over the vent holes as the intense heat may injure any exposed rubber. Using four heaters for fifteen minutes for four batteries and electricity at sixteen cents per K. W. H. will cost four cents or one cent per battery. Figuring space heaters at three dollars and some for switches and box, this whole outfit need not cost over fifteen dollars, whereas a box of this type together with a steamer and necessary heating burner would cost many times this amount.

My experience with a steamer has been that the only successful steamer for the average battery station is a steam boiler with rubber hose connections which can be inserted at the vent holes of the battery. These can be made by anyone handy with a soldering iron and should be made of sheet copper, and should have at least six petcocks, should be equipped with water glass if possible, and an automatic float water-regulator is a handy addition too. It is needless to say that an outfit of this sort with its gas or gasoline burner costs more than the electric oven above mentioned.

The electric oven is handy for small jobs on short notice and original expense is small but the compound on a steamed battery is less sticky and in case a person wishes to remove a jar it is an easy matter to cover the jar and insert the steam hose. It is true that the steamer has advantages over the electric oven but not from the standpoint of the heater above referred to, and think an electric oven is well worth its cost in any shop where the steamer is not used continuously, and especially where there is no city gas.

In Mr. Witzel's letter he figures the cost of softening the compound on the basis that the current is paid for at 16 cents per K. W. H. In battery stations using current for charging purposes the rate is often lower than this which would give a corresponding reduction in the cost of opening the battery. Motor Age wishes to express appreciation for cooperation shown by its readers and evidenced by such letters as the one Mr. Witzel has sent us.



Parts of double reduction gear axle

ADJUSTING MACK DOUBLE REDUCTION REAR AXLE

Q—Publish a diagram of the rear end of the Mack A. B. two ton truck. Explain the adjustment of the pinion and ring gear.—A Subscriber, Jersey City, N. J.

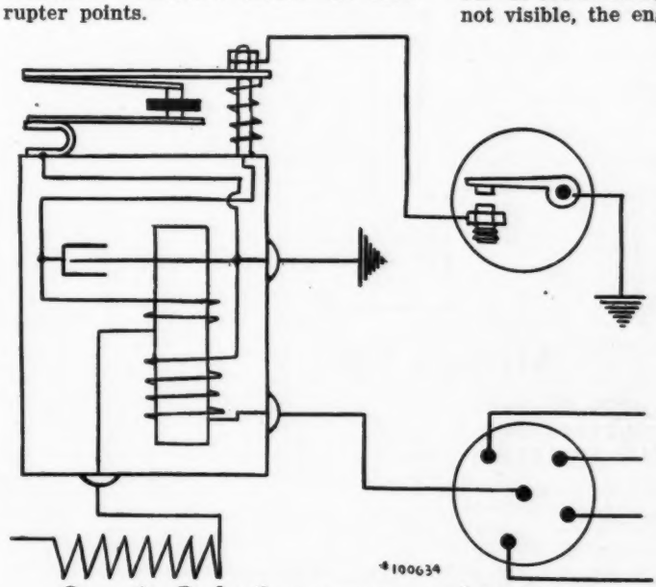
You do not state whether the A. B. two ton truck is a worm drive, a chain drive or a double reduction. Illustration of the double reduction axle is shown above. We believe that the illustration is self explanatory. The pinion is adjusted in its relation to the ring gear by the removal or addition of shims between the differential carrier studs and the pinion housing studs as shown in the illustration at "A." An adjustment is provided in the pinion housing for compensation of the wear of the Timken bearing. You will also note that the ring gear which also carries the spur pinion is threaded on each end of the shaft to which it is fastened.

These threads carry a collar which moves the Timken bearings of the ring gear carrier in or out to secure the necessary lateral adjustment. The adjusting collars are not shown in cut but they screw onto each end of shaft as indicated at "B." The plate at "D" carries a Timken bearing whose movement is controlled by the adjusting collars.

The spur gear or full gear which is the final gear in the double reduction train is also mounted on Timken bearings and is adjustable in a manner similar to the adjustment of the ring gear. All of the adjustments outlined here can be made without the removal of the axle from the car and with the exception of the adjustment of the pinion the ring gear adjustment is accomplished in exactly the same manner as the adjustment of the ring gear on the conventional types of passenger car axles.

CORRECTION

In The Clearing House of May 25 we showed a method of using a Ford coil as a replacement for other types of battery ignition coils. In the case where it is desirable to use the condensor from the Ford coil as well as the winding, we showed a wire running from the vibrating spring to the interrupter. On most coils, however, this would not be correct and this has been called to our attention by R. H. Reed of Heaton, North Dakota. Most of the coils have the connection from the condensor to the interrupter points crossed or reversed from those shown in our sketch and we are accordingly showing diagram below which gives the internal circuits as they now are on the majority of Ford coils. This requires connecting the adjusting screw instead of the vibrating contact to the interrupter in order to get the condensor connected across the interrupter points.



Connecting Ford coil as a temporary replacement unit

LIGHTS ON CHEVROLET 490

Q—We are having some trouble with the lights on a Chevrolet 490. When the engine is standing the lights are O. K. and when the engine is running at a speed equivalent to 25 m.p.h. the lights are somewhat brighter but when running below this speed they get dimmer as the engine slows up. We have also found this trouble on an Overland 90. What is the cause of this condition?—M. M. Welch, Surprise, Nebr.

1—The dimming of the lights is possibly due to the cutout switch failing to open until a rather heavy discharge current is flowing. The remedy would be to increase the spring tension in the cutout and if the cutout then closes too late when the engine speeds up, the magnetic air gap should be reduced somewhat. There will be some tendency to experience the condition you describe on any car even with proper adjustment.

Valve Timing of Marmon

Q—What is the valve timing on a 1917 Marmon 34 in inches?

1—In order to obtain the best results from the engine, it is essential that proper valve tappet clearance be maintained between the end of the valve stem and the rocker arms. The proper clearance on this engine is .008 of an inch with a hot engine. The engine may be timed by the use of the flywheel markings as follows: Remove the header cover and twirl between the fingers the long push rod for the number 1 intake valve, while someone slowly turns the starting crank. Stop the engine at the exact point when the push rod is no longer free to turn and note the markings on the flywheel. If the engine is properly timed, the line mark IN-OP near the TC-1 and 6 will be directly under the pointer. The exhaust valve is tested in the same way, except that the mark EX-CL is used to show the point at which the exhaust valve closes. The point at which the intake closes and that at which the exhaust opens are not shown, as if the other markings for the same valve are correct these are sure to be. If the markings on the flywheel are not visible, the engine can be timed by the setting of the exhaust valve closing point. Measured on the rim of the flywheel, the exhaust valve should close past the upper dead center 1¾ inches measured on the outside rim of the flywheel. The inlet valve should open an inch farther on, or 2¾ inches past the top center position.

2—What would be the maximum r.p.m. of a Dodge engine if it was balanced and light pistons and overhead valves, high speed camshaft and everything put in to increase its revolutions. — Rae Hudson., Arkansas City, Kansas.

2—Generally speaking, if the changes which were outlined in your question are incorporated in the engine and if the proper size carbureter is installed and all parts carefully fitted and the entire assembly put into perfect balance, the engine should show a maximum of about 3,500 revolutions.

GAS CONSUMPTION OF LIBERTY AIRCRAFT

Q—How many gallons of gasoline will a 450 h. p. Liberty engine use per hour under full load?—Glen F. Stage, Ligonier, Ind.

Consumption of gasoline per brake h.p. hour of a Liberty engine will vary from .51 to .57 pounds per brake h.p. hour. Assuming the average consumption to be .53 pounds per brake h.p. hour and the weight of gasoline is 6.70 pounds per gallon the consumption would be approximately 35½ gallons per hour. This amount will vary in the different engines from 32 to 37 gallons per hour on wide open throttle.

DEEPLY WORN CUP IN ROCKER ARM CAUSES PUSH ROD BREAKAGE

Q—Can you give the reason why push rods break at ball socket on a Grant 6, model HX. Installed a new rod and tested engine only to break another rod. Valve clearance is all right and rods are in their seat.

If you will remove the rocker arm from that cylinder which is continually breaking push rods and grind the rocker arm ball seat it will entirely eliminate this trouble. The breakage is caused by the push rod ball seat in the rocker arm having worn to a depth, where, when the valve is fully open, the push rod has no freedom of motion and the tendency of the rocker arm is to push the ball from the push rod end. This being due to the fact that the bottom of the rocker arm will strike the push rod near the base of the ball. Decreasing the depth of the seat in the rocker arm by grinding which should be done to a depth of about 1/16 at most and approximately 1/32 of an inch will entirely cure this trouble. Better still secure a new rocker arm.

2—Send an instruction book for Grant 6 model HX, I wrote to Detroit but they did not have any.—F. A. Lilly, New York.

2—Regret to state that we have no instruction books available but if you will address a letter to the Grant factory which is located in Cleveland, O., they will be glad to supply you with a book covering instructions on this particular model.

SUGGESTION FROM READER

Referring to your answer to Edison W. Bennett, Pawnee, Okla., page 42, June 15th issue regarding Chevrolet 490 overheating. We had two 490's like the one referred to, some time ago, and the first one just about drove us frantic. We finally found the trouble however, and the car has since traveled some very difficult sand roads without overheating. If Bennett will carefully check the depth of dip of the connecting rod splasher into the oil trough, we believe he will find it so little that the cylinders are simply being under lubricated. To relieve the trouble on the two we raised the troughs 5-16 in., and they have "lived happily ever since."

We find Mobiloil Arctic works very nicely on the 490 and unless the rings are leaking badly we have no trouble stopping overheating. Bennett does not mention "blow by" of the pistons or rings, but would suggest he look for trouble of that nature also.—Victory Auto Service, Per, Wm. M. Breytspraak, Chicago, Ill.

Note—This letter is open to considerable discussion, as one would at first believe that lack of lubrication would also affect the connecting rod and main bearings. We are printing it verbatim for the consideration of those who are engaged in servicing the Chevrolet.

GEAR RATIOS OF ESSEX

1—What gear ratio was used in the rear axle of Model 6A Essex roadster No. 62510?

1—This car was made in 1918 or 1919 and had a 4.66 gear ratio.

2—What ratio is used on the rear axle of the latest model Essex coach?—H. S. Castle, Castle Auto Repair Shop, Ogdensburg, N. Y.

2—According to specification sheets this is shown as 5 1/11 gear ratio, but we are advised that the 4.66 ratio is also used.

TO SETTLE A WAGER

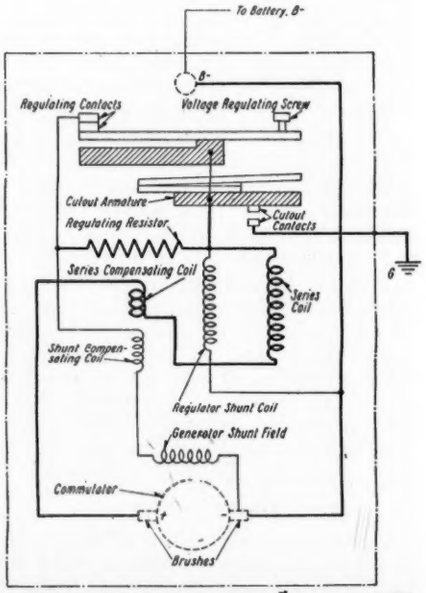
Q—In order to settle a bet would like to have you state how many miles was the race which was held at the speedway in Chicago, sometime in June of 1918. The winner of the race was Louis Chevrolet.—D. Klaich, Joliet, Ill.

On June 22, Louis Chevrolet captured the 100-mile handicap event at the Chicago speedway. His Frontenac did the 100 miles in 55 min. 29.60 sec. an average of 107.9 m.p.h.

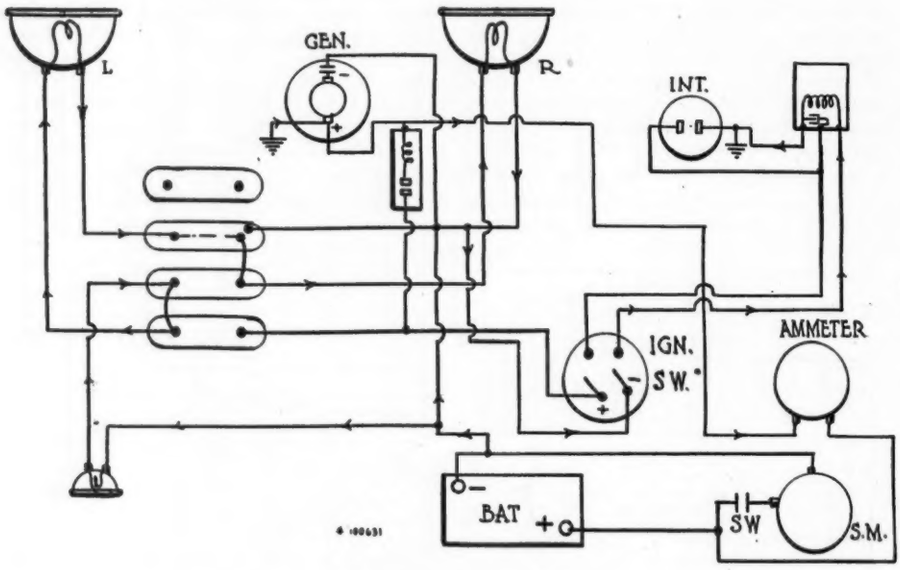
INTERNAL CIRCUIT AND WESTINGHOUSE GENERATORS

Q—Publish internal circuit of Westinghouse No. 208R generator used on 1916 Chalmers model No. 35A, car number 65433.

Diagram is shown below.



INTERNAL CIRCUITS OF WESTINGHOUSE 208R GENERATOR ON 1916 CHALMERS



Mystery Tale

WHAT DO YOU THINK OF THIS EXPLANATION OF PECULIAR ACTION OF TAIL-LIGHT?

On page 46 of the May 25 issue of MOTOR AGE there was given a mystery tale in regard to the peculiar action of taillight which would light up whenever the ignition switch was turned on. We are not quite sure whether the problem is too deep or just what is the matter but up to date have had but one answer sent in. The diagram submitted by way of explanation is shown below and the subscribers explanation is as follows: On the drawing the path of the current may be traced by the arrows. The current would have to pass through both headlights, the ignition switch and the primary windings to ground in the interrupter. The current would then go through ground to the positive main brush at the generator and back to the battery through the ammeter. When the switch is in the bright position the current would flow through the left headlamp only and through the ignition circuit to ground. The headlights would not light because a small amount of current allowed to flow due to the taillight resistance of the ignition winding would not be enough to heat up the headlight filament. The removal of either of the two grounds would break the circuit. The negative side of the ignition system would act as a sort of neutral wire carrying both positive and negative current at the same time.—E. K., Chicago, Ill.

When this solution was received we thought at first that the problem had been solved but on closer examination something wrong in the answer. See if you can find what is wrong.

Reasons for Noisy Tappets

Q—Why is the roller type tappet more quiet than the mushroom type? How can a tappet with just barely perceptible play in the guide cause a noise? How do some tappets make more noise than others when everything concerning both is apparently in the same condition? Can hard steel inserts in the tappet adjusting screw create any unusual noise? Would fiber or hard wood inserts be satisfactory in reducing tappet noise and giving good service. The above questions apply particularly to a 1917 Model Hudson in which we have been unable to get quiet operation.—Frank R. Kutschenreuter, San Antonio, Texas.

The above inquiries will be handled more or less specifically in a general discussion on valve tappets. On the car in question it is possible that you are using too much clearance between the valve stems and the tappets. On the intake valve this should be .003 in. cold and on the exhaust valve should be .004 in. cold. The fiber and wood inserts have been tried and while they give slightly more quiet operation are not durable as they hammer out and the adjustment changes very rapidly.

Tappet noise due to looseness in the guides is due to the same general principle that causes piston slap. This is because the valve spring is always pressing down in a vertical direction while the thrust from the cam is never vertical except when the cam point is up. When the cam first starts to lift the push rod there is a sideways thrust due both to the friction of the cam as it slides across the face of the mushroom also due to the angularity. On the other hand when the cam is receding and is lowering the valve the action of the spring pushing the valve down causes a reaction in the other direction.

This means that the valve tappet is first thrown violently against one side of the guide and then back against the other side at every rise and fall of the valve. It is accordingly easy to see that it does not take very much looseness to cause a very perceptible noise. The use of the roller type instead of the mushroom valve tappet reduces some of the side action because of the reduced friction but there is still some side action due to the direction of thrust from the cam. Another possible cause of noise is a slight bounce which occurs when the valve and tappet come down. This can be reduced by the use of new springs in case the old ones have lost some of their tension. On the Hudson 1917 model to which you refer especially it is now customary to use a 10 coil spring.

It might also be well to check up the springs roughly by comparing their tension and any that appear to be especially weak should be replaced as this will eliminate somewhat the tendency for the tappets to bounce and cause additional noise. The reduced noise in the roller type tappets may also be attributed to a lesser tendency for it to bounce. The hard steel inserts in the tappet adjusting screws could hardly produce additional noise except as their elasticity would increase the bouncing tendency with weak springs. In one part of the inquiry you ask how some tappets can make more noise than others when everything concerned in both is apparently in the same condition.

The answer is undoubtedly indicated by the word "apparently," for from a common sense engineering standpoint it is evident that if everything was exactly the same the operation would be the same. The answer is no doubt in our human inability to actually make things alike as illustrated in the fact that all mechanical parts are made with allowances of a few thousandths more or less on account of our inability to make parts to exact dimensions.

Cause of Burnt Electrodes

Q—We have a Ford that has been overhauled recently. In removing the spark plugs about every two weeks we find that both points are badly burnt. Would a hot spark be the cause of this or what condition in the ignition system would produce this trouble. This Ford will not start on magneto even when warm and has run about 2,000 miles since being overhauled. It has been equipped with a new timer and roller, also coil points. A new carbureter has been installed and it will not idle less than 12 miles per hour. Compression is good and it does not pump oil.

1—The cause of the burning away of the points in the Ford spark plug should evidently be due to one or two reasons. Either the spark plugs have the points made of inferior metal which burns away under normal operation, or else the spark is exceptionally hot. Excessive heat of the spark, however, would on this car apparently be due to poor coil adjustment as you state that the engine will not start on the magneto, which would apparently indicate that the magneto is in poor condition. To fix up the magneto would suggest recharging the magnets without removing them from the engine.

This can be done as described in the April 13 issue of MOTOR AGE, page 45. To check the coil settings would suggest connecting an ammeter in the circuit which carries battery current to the coil box. The engine can then be turned over slowly by hand with the ignition switch in the battery position and as soon as the timer makes contact current will flow from the battery to the ammeter and through the ignition coil and this current should be from 1.25 to 1.5 amperes. If a very heavy current is drawn from the battery it will produce a correspondingly heavy secondary spark which will burn the spark plug points unnecessarily. With good compression the trouble in idling is doubtless due to either ignition or carburetion.

In order to check the ignition at low speeds you can remove a wire from a spark plug and hold it within 3/16 in. of the engine and see if at low speeds the sparks jump this gap every time. This test should be made at each spark plug.

2—We have a 1918 Buick roadster which knocks at certain times. Sometimes it will knock on a pull or going up a hill and other times it will not do so. When the car is standing still and engine idling it is not possible to get the knock, although when running it sounds like a connecting rod. What could be the cause of this trouble, as the motor has been overhauled and everything put in good shape.—A Reader.

2—In regard to the 1918 Buick roadster which is knocking at certain times would suggest that you check up the following points: Loose connecting rod bearings. Loose main bearings. Connecting rods not properly lined up, that is, being either slightly twisted or slightly bent.

Piston slap due to having too much clearance. This can only be checked by removing pistons and using micrometers both on the pistons and on the cylinders. While you state that the motor has recently been overhauled and everything put in good condition it is obviously not the case although, no doubt, an attempt was made to do a good job. The fact that there is a knock proves that everything is not in good shape. We know of a case where a Ford engine was completely overhauled by a maintenance station capable of turning out very good work and after running some 600 or 700 miles the engine developed a knock similar to the one you described which sounded exactly like a connecting rod knock. The car was taken back to the service station and the connecting rods found to be all right. The main bearings, however, were found to be loose and when all three were tightened up the trouble was eliminated. This merely illustrates that while certain conditions in the engine will produce certain characteristic symptoms, it is not always advisable to depend entirely on the relation of the symptom to the location of the trouble as exceptions will occur which are sometimes misleading.

Other causes of knocking are bent camshaft or crank shaft, also worn camshaft bearings.

CORRECTION

SPECIAL AMMETER CAN BE INSTALLED EASILY ON 1915 DODGE

On page 43 of the June 15 issue of MOTOR AGE there was an article entitled, "Cannot install ammeter on 1915 Dodge." This article is correct as far as the usual type of ammeter is concerned. Our attention has been called, however, to a special ammeter which is put out by the Roller-Smith Co., 233 Broadway, New York City which can be used in a circuit which carries both starter current and generator current. This is known as catalog No. 8202 Universal PV ammeter and is specially designed to be used on cars of this type, also on farm lighting outfits and in any place where a heavy current is used in starting followed by a smaller current used when the machine is operating as a generator

SOME POINTS ON ENGINE TIMING

Q—Explain operation of the circuit breaker mounted on the back of switch as found on the Oakland model 34-1917. These points seem to stay closed at all speeds. This model has Delco generator and coil mounted on generator.

1—The circuit breaker on the back of the lighting switch takes the place of fuses. It is never supposed to operate and the points are always supposed to stay closed except in case trouble develops in the wiring so that a very heavy current is drawn. Under such circumstances the magnetic effect of the coil in the circuit breaker is strong enough to open the points and a vibrating action will then occur which protects the wiring from carrying excessive current.

Timing an Engine

2—Name some cars of late models in which the spark is timed by setting the piston on top dead center on compression stroke and having the breaker points just ready to separate with the spark lever fully advanced. We understand some cars are set at full advance and some at full retard. Explain the difference. According to Dykes Automobile and Gas Engine Encyclopedia the Oakland model 34 should be set with the breaker points just opening with spark lever fully advanced but we find the car runs better when set with the points to open at full retard. When the ignition switch is turned on the ammeter shows full discharge. What is the reason for this?—A Subscriber.

2—The misunderstanding in regard to methods of timing is possibly based on a misunderstanding of the requirements of the engine. The reason for retarding the spark when starting an engine is to prevent its kicking back. In other words the piston must be allowed to come to the top of the stroke and to have barely started on the down stroke before the gas is fired. This insures the engine running in the right direction instead of kicking back. If it did not take any time for the flame to spread through the gas mixture there would be no need for advancing the spark.

Advancing the spark merely means that we have it occur sooner in regard to the time at which other events in the engine occur.

As it takes an appreciable time for the flame to spread through the mixture and we wish to have the full force of the explosion while the piston is at the top of its stroke we naturally want to start things sooner. The correct amount of advance at different speeds is therefore a matter of experiment so that it depends more or less on the experience of the driver and his ability to operate the spark advance lever to get it in the right place for various speeds. On certain cars however the Hudson being a typical example, automatic spark advance is used where a pair of weights fly out at high speed and rotate the ignition shaft so as to make the spark occur sooner.

Hand advance is also used with these ignition outfits in order to correct the setting of the device for the exact requirements of the particular engine and character of work it is doing. After an engine of this type has been used for a while it is found that the spark can be set from the advance position as well as from the retard, but as far as we are aware the advance setting is never used on dead center.

The Hudson car referred to has a letter (A) stamped on the flywheel and when set at this letter (A) the flywheel is approximately 1½ in. before dead center so that if the spark occurs at this time it is advanced. However, if set in this way retarding of the lever will then allow the spark to occur later. Under these circumstances it does not make much difference which way the spark is set and in general any car can be timed by having the spark in retard occur due to the breaking of the interrupter points when the piston has just come up to top dead center and barely started down again.

The confusion no doubt arises from the fact that there are often many ways of doing the same thing, any one of which may be correct. It is our personal preference however to always work from the retard position and let the advance take care of itself. In regard to the discharge reading showing on the ammeter when the ignition switch is turned on would say that in most Delco systems a connection is not only made to the ignition coil but also to the generator and as the ignition circuit may draw about five amperes and the generator 10 or 15 amperes it may cause the ammeter to go off the scale. If you wish to check either circuit separately you can do so by disconnecting the other. For example the small wires on the motor generator can be disconnected and the ammeter will then show ignition current only, or the ignition coil can be disconnected and the ammeter will then show the current which is used by the generator when running as a motor.

This motoring action of the generator is used so that it will be easy to mesh the starter gear with the flywheel. The missing of the car at low speeds may be either due to carbureter or spark. The spark can be checked by taking a wire from the spark plug and holding it near the engine, a 3/16 gap being satisfactory. If the spark is in good condition and clean plugs are used it is then time enough to check up on the carbureter.

READER'S SUGGESTION

The following suggestion has been received from P. M. Rupert, 741 Park Ave., Dunkirk, N. Y., regarding overheating of a Chevrolet 490 engine. Sometimes in casting a cylinder block a web will be formed between the cylinder wall and the water jacket, or the space completely closed up at points, which will pocket the water and prevent its circulation. This condition usually manifests itself by certain portions of the engine block becoming much hotter than the rest.

I would suggest that all the water be drained from the system. Then refill by measure, the capacity of the complete system being one and three-quarters gallons. This test will check the cylinder block and also the radiator if it has had bran or other clogging material poured into it to stop leaks.

Again the rubber lining of the hose may have become loosened and restricts the passage of water. I have known cases where new water manifold gaskets have been made without cutting out the hole for the water to pass through. Also check the pitch or rake of the fan blades and if necessary twist them until a good suction is felt in front of the radiator. Perhaps the radiator has had a heavy coat of paint applied to the cooling fins instead of lampblack thus causing engine to heat very rapidly.

Editor's Note—The suggestions as outlined by Rupert are very logical and should provide a good basis for elimination.

MAXWELL MASCOTT ROADSTER

Q—Answer the following questions concerning a Maxwell Mascott Roadster 1912 model.

1—Show by sketch or describe method of removing the transmission shaft which has four gears on it from its recess in the transmission case.

1—Before removing the counter shaft with the four gears on it, it is necessary to remove the sliding gear shaft. This is accomplished by first loosening and removing the bearings at the two ends of the sliding gear shaft which makes it possible to take it out. Same method can then be applied to the countershaft, first the bearings and then the shaft itself being removed. The gears are pressed on to the countershaft and can be removed with an arbor press.

2—Where may low speed countershaft gears be obtained?

2—From Maxwell Motor Sales Corp., East Jefferson Ave. and Belt Line, Detroit, Michigan.

3—With what carbureter was this car factory equipped?

3—Maxwell made their own carbureter for this car.

4—What was the horsepower of this engine?

4—25.6 S. A. E. horsepower.

5—What was the bore and stroke?—Edward Garage, Kennard, O.

5—4 by 4.

A BETTER WAY TO REMOVE A VALVE CORE

A stuck valve core is an every day occurrence, especially in a large tire repair business. The method used in one shop when they find a stuck valve core is to inflate the tire, if it is still on the rim leave it there, if it is only the tube, inflate it, as much as possible, then take a small flame, such as a small torch or an alcohol lamp, or four or five matches will make the necessary heat to apply to the sides of the valve down as far as the core, then get your eye out of the way for, as soon as the rubber on the core gets hot the air blows it out.

The ACCESSORY SHOW CASE

New Sources of Retail Profit

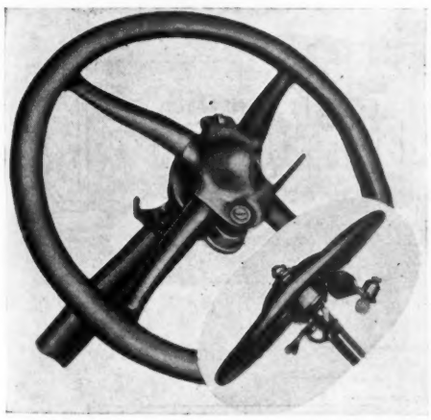
ENSIGN STOP SIGNAL

The operation of the Ensign signal is effected by the motion of the car itself. There are no attachments to brake, clutch, or the dash. The signal is lighted by the motion of the car when the brakes are applied. The arrested momentum automatically lights the Ensign. Spengler-Lewis Mfg. Co., 59 E. Washington St., Chicago, Ill.

MOTORIGHT FORD LOCK

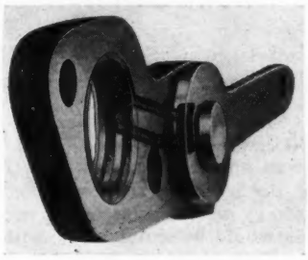
A lock made entirely of steel. When locked it covers the hub of the steering wheel and grips all four spokes.

The lock screws on in place of the steering gear cover and can be installed with a wrench and a hammer in five minutes. The arrangement of the standard Ford parts is not changed. $4.90. The Packard Engineering Co. of Cleveland.



JEAVONS SPRING LUBRICATOR

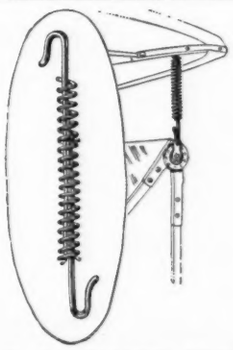
The Jeavons is a flexible spring lubricator made for all makes of cars. It fits over the entire spring—keeping it free from dirt and water. An inner layer of fabric covered either with leather or leatherette gives this lubricator unusual oil retention capacity, flexibility and beauty. Its oil conveyors carry lubrication along the edges of the spring leaves, keeping a constant supply around every moving part. Jeavons Manufacturing Co., Cleveland.



LITTLE GAS MAN

Breaking up of the gas particles into smaller and finer form, is the duty of the Little Gas Saver. This uses the amount of gasoline that passes through the motor unexploded, which is due to the gasoline not being broken up fine enough to create a highly combustible charge and the lack of proper amount of air and oxygen that the Little Gas Saver supplies.

It is operated by the spark lever.—Retail Price, $4.25. Rockford Motor Products Co.

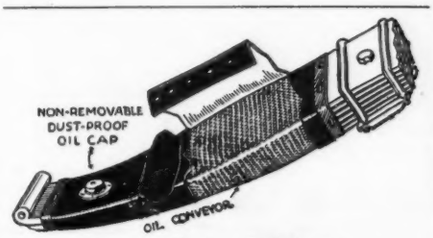


ARG AUXILIARY SPRING

The new ARG product can be easily and quickly installed by anyone, and it requires no tools, either to install the strap or to adjust it. $1.00 per set of two. ARG Auxiliary Spring Company, of Birmingham, Ala.

C AND S ENGINE CLEANER

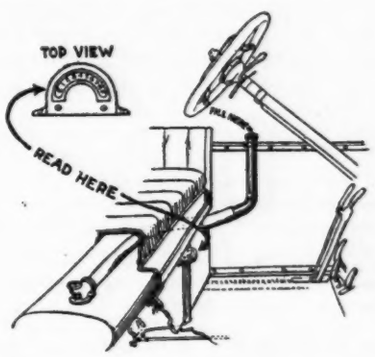
The C. and S. engine cleaner is used with compressed air and kerosene. It gives a powerful spray. The air is used to dry or to remove dust. Codman & Shurtleff, Inc., 535 Albany St., Boston, Mass.



Jeavons Spring Lubricator

E-Z-4-U FILLER AND GAGE

The E-Z-4-U Filler and Gage is the product of the Custer Mfg. Co., Stoyestown, Pa. and is for Ford cars only. As the gasoline is put into the tank, through this filler, it is filtered and the gage shows the exact amount being pumped into the tank. Also, the gage acts as a warning against running out of gasoline. There is no need of lifting the seat either to put gasoline in or to see the amount already in the tank.

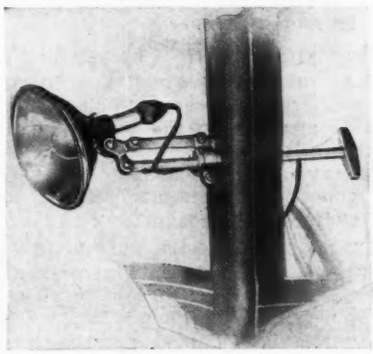


HAYES PATHFINDER

The Hayes Motor Truck Wheel Co., at Jackson, Mich., announce the Hayes Pathfinder spot light for open or enclosed cars. It sells at retail for $8.50.

It has an inside control, and can be so adjusted that besides a driving spot light, it can be used for a trouble light for tire changes or motor adjustment. The reflector is coated with pure silver which results in a concentrated white beam of light.

All its parts are full nickel on brass, and the shell is a rich dull black enamel.



FALOR INNER TUBE

The Falor tube is seamless and made with a cross grain of rubber. The valve base and splice are brought out in a new manner. Falor Rubber Co., 910 S. Michigan Ave., Chicago.

When Is a Ground Not a Ground?

The Safety Feature in the Action of Magnetically Operated Starting Switch Illustrates This Seeming Electrical Contradiction

This Article Suggested by an Inquiry Sent to the Readers' Clearing House in Regard to Use of a Mercer Starting Switch on a Templar Car

As the current required for operation of the starter is very heavy compared to the other currents used, it has often been found that the starter switch, when designed to handle this heavy current, was somewhat cumbersome and awkward to operate. This has led designers to occasionally consider the use of a magnetically operated switch, being controlled by a comparatively small current so that a small push button can be used, mounted on the dash or cowl board.

One of these devices has been in use by the Westinghouse Electric and Mfg. Co. in connection with some of its starter systems for many years, a tribute to the designer's ability and foresight. This device has been used recently on Mercer cars, and in accordance with a request recently received from one of our readers we have shown in Fig. 1 how this may be adapted to a Templar car, this information being available by referring to Fig. 1.

The general way of making such an installation is shown in Fig. 2 where a typical starting and lighting wiring layout has been changed just enough to make the use of the magnetic switch possible. The heavy cables are used as in any system to ground the battery and to connect its other terminal to one side of the starter switch, the other side being connected to the starting motor. Also as in the typical starting system, a wire leads from the battery side of the starting switch to the ammeter, and from the other ammeter terminal wires go to the generator and out to lighting switch and ignition switch.

The starting switch is operated by the coil or solenoid in which a cylindrical piece of iron is located. This piece of iron is attached to the copper portion of the switch which when lifted closes the heavy circuit by making contact with the copper segments at both sides of the switch. The magnetic effect of a coil carrying an electric current is well known so that it is only necessary to allow such a current to flow, to pick up the iron cylinder and hence lift the copper switch blade, thus closing the starter circuit, to crank the engine.

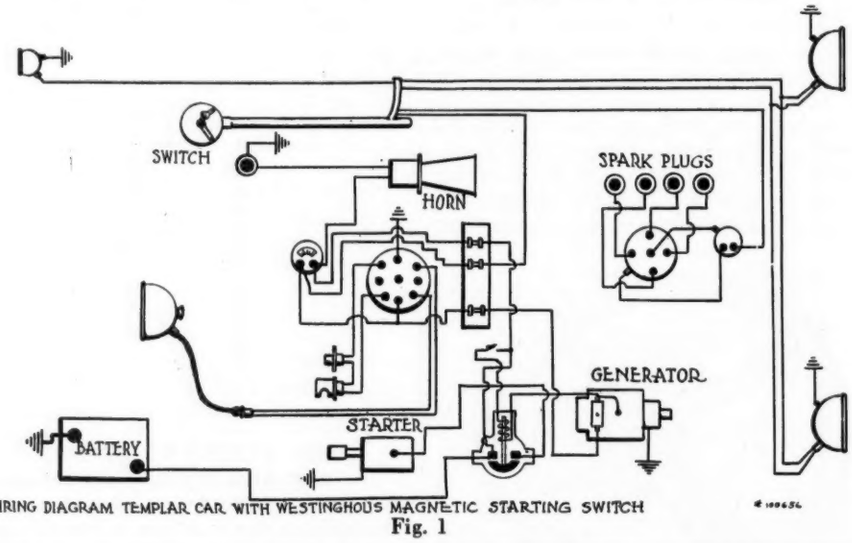
The Solenoid Circuit

The right side of the solenoid circuit in Fig. 2 is shown as connected to the starter button which would be located on the cowl board, and by pressing this button it will be seen that connection is made to the live side of the battery through the ammeter. It would therefore seem advisable to connect the left side of the solenoid to ground or negative battery to make it work properly, and this would be satisfactory with most systems, but there is a better method available, in which the system is made practically foolproof, for the starter button can be operated with the engine running without working the starter switch, and yet when the engine stops, operation of the button will work the magnetic switch and actuate the starter.

When a Ground Is Not a Ground

As shown in Fig. 2 the connection for the left hand side of the solenoid is made to the cutout terminal on top of the generator which connects directly to the live or insulated brush, but at the moment that we start, the generator is not turning or is turning very slowly, so that we may consider that this brush is connected right through the comparatively low resistance of the armature to the other brush which is grounded. We therefore have one side of the solenoid grounded through the generator armature, while the operation of the starter button connects the other side to the live side of the battery. In this case the ground IS a ground.

Let us see what happens as soon as the engine starts and the speed of rota-



WIRING DIAGRAM TEMPLAR CAR WITH WESTINGHOUS MAGNETIC STARTING SWITCH

Fig. 1

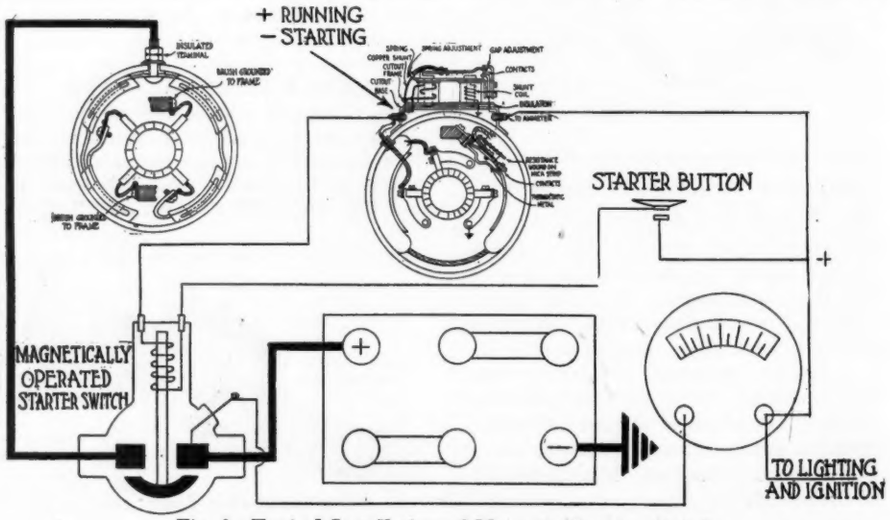


Fig. 2—Typical Installation of Magnetic Starting Switch

COMING MOTOR EVENTS

AUTOMOBILE SHOWS

Toronto	Canadian Nat'l Exhibition	Aug. 26-Sept. 1
Columbus, O.	Columbus Auto Dealers Co.	Aug. 28-Sept. 3
Decatur, Ill.	Industrial Exhibition and Automobile Show	Aug. 30-Sept. 9
Indianapolis	Indianapolis Automobile Trade Assn.	Sept. 4-9
Wilmington, Del.	Delaware State Fair	Sept. 4-9
Hartford, Conn.	Connecticut Fair Grounds	Sept. 4-9
Spokane, Wash.	Annual Show	Sept. 4-9
Memphis	Memphis Automobile Dealers' Assn.	Sept. 23-30
Washington,	City of Closed Car Salon	Oct. 21-28
Chicago	Annual Show of the Automotive Equipment Association	Nov. 13-18
New York	Annual Show	Jan. 6-13

CONVENTIONS

Olympia	Washington Automotive Trade Assn.	July 21-22

FOREIGN SHOWS

Berlin	Kaiserdamm Hall	Sept. 25-Oct. 3
Rio de Janiero	Automotive Exhibition	Sept., 1922
London	International Commercial Vehicle Exhibition	Oct. 12-13
Paris, France	Automobile Show	Oct., 4-15
London	Annual Show	Nov. 3-11

RACES

Strasbourg	French Grand Prix	July 15
Colo. Spgs., Colo.	Pike's Peak Race	Sept. 4
San Carlos, Cal.	500-Mile Armistice Day Race	Nov. 11

tion of the generator is sufficient to make it generate some 7 or 8 volts. The ground brush is still negative in our illustration but due to the generated voltage the insulated brush is now positive and as the cutout closes and connects this live brush through the ammeter to positive battery, it is not only positive, but we might say the same potential or degree of electrical pressure as the positive battery terminal. In other words, the generator voltage across the brushes is nearly the same as the battery voltage across its terminals.

Operation of the starter button under these circumstances connects both sides of the solenoid winding to positive battery so that no current flows and nothing happens. With some of the starter systems this was a very valuable feature, although with starters using the Bendix drive, there is not much chance of trouble occurring even if the engine is running when the starter switch operates.

Tractor Trucks to Haul 5 to 15 Tons Made By G. M. C.

PONTIAC, Mich., July 17—Three new models of truck tractors have been placed on the market by the General Motors Truck Co. The tractors are designed to meet a growing need in the transportation business for an adequate power plant to haul semi and full trailers carrying a load as high as 15 tons. Claims are made for the tractor-trailer combination, by the General Motors Company, that there are a great many instances where the transportation costs can be reduced as much as 50 per cent and will enable a concern to transport goods over any state highway with a load as high as 15 tons without violating any state laws governing truck loads.

This is, of course, accomplished by so designing the tractor and trailer combination that the load is distributed evenly over from six to eight wheels, which will comply with state laws governing pounds per wheel truck load.

The new tractors are to be put out in 5, 10 and 15 ton models. The standard General Motors truck design is the foundation for the tractors, the necessary equipment and departure being made to take care of the trailer and semi-trailer attachment. The company is using the heavy-duty power plant in the manufacture of these units and standard equipment will include the convertible cab and hubodometer. The prices, completely equipped, are:

5-ton Tractor	$2650
10-ton Tractor	3900
15-ton Tractor	4250

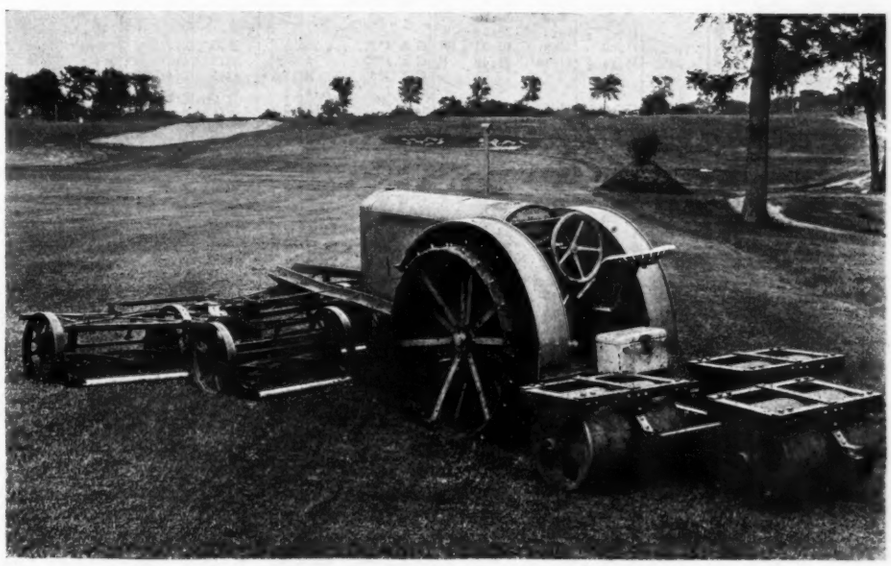
DANIELS TO DOUBLE OUTPUT

READING, Pa., July 17—George E. Daniels, president of the Daniels Motor Co., announces that plans have been perfected to double the output of the corporation's plants, beginning Sept. 1. Preparations are now being made for the exhibition of several new models of enclosed Daniels cars at the Closed Car Show in New York this fall.

Safety Contest for School Children Renewed This Year

NEW YORK, July 17—The National Automobile Chamber of Commerce has voted to renew this year its offer of $5,000 in prizes for school children and $1,500 in awards to school teachers for the best essays and lessons on safety. Last year there were more than 500,000 contestants. Awards have been made in the various states and the national prize winners for 1921 will be decided upon soon.

The direction of the contest this year, as last, will be by the Highway and Highway Transport Education Committee, Washington, D. C., with the endorsement of the United States Bureau of Education. Edward S. Jordan is the special representative of the National Automobile Chamber of Commerce in connection with the contest.



Tractor Equipment for Golf Courses

Are the golf courses in your community properly equipped? If not, why not sell them a few Toro machines? It is a good rest period selling exercise

Specifications of Current Motor Truck Models

NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES Front	TIRES Rear	Final Drive
Acason	¾-1	$1650a	3½x5	34x5n	34x5n	W
Acason RB	1½	1950	3¾x5¼	36x3½	36x6	W
Acason H	2½	2750	4½x5½	36x4k	36x8k	W
Acason L	3½	3450	4½x5¾	36x5k	36x10k	W
Acason M	5	4350	5 x6¼	36x6	40x12	W
Ace C	1½	2295	3¾x5½	34x3½k	34x5k	W
Ace A	2½	2795	4¼x5½	36x4k	36x7	W
Acme 20	1	....	3¾x5	35x5n	35x5n	W
Acme 30	1½	....	3¾x5	34x3½	34x5	W
Acme 40	2	....	3¾x5	34x3½	34x5	W
Acme 60	3	....	4½x5½	36x4	36x7	W
Acme 60L	3	....	4½x5½	36x4	36x7k	W
Acme 90	4½	....	4½x5½	36x5	40x10	W
Acme 125	6½	....	4¾x6	36x6	40x12	W
American 25	2½	3350	4 x6	36x4k	36x4dk	W
American 40	4	4275	4½x6	36x5k	36x5dk	W
Armleder 20	1	2350	3¾x5¼	34x3½k	34x5k	W
Armleder 21	1½	2425	3¾x5¼	34x3½	34x6	W
Armleder 40	1½	2850	4½x5¼	34x3½	36x6	W
Armleder HW	2½	3200	4¼x5½	36x4k	36x7k	W
Armleder KW	3½	4150	4½x6	36x5	36x5d	W
Atlas MD	1	1185	3½x5	32x4½n	32x4½n	W
Atterbury 20R	1½	2475	3¾x5	34x3½	34x5	W
Atterbury 7CX	2½	3175	4½x5¼	36x4	36x4d	W
Atterbury 7D	3½	3975	4½x5½	36x5	40x5d	W
Atterbury 8E	5	4975	4¾x6	36x5	40x6d	W
Autocar 21UF	1½-2	1950	4¾x4½t	34x4k	34x5k	D
Autocar 21UG	1½-2	2050	4¾x4½t	34x4k	34x5k	D
Autocar 27H	2	2950	4 x5½	34x5	36x7	D
Autocar 27K2	2	3075	4 x5½	34x5	36x7k	D
Autocar 26Y	5	3950	4½x5½	34x6	36x12	D
Autocar 26-B	5	4100	4½x5½	34x6	36x12	D
Available H1½	1½	2475	4 x5	36x3½k	36x5k	W
Available H2	2	2775	4 x5	36x3½k	36x6k	W
Available H2½	2½	3160	4 x5	36x4k	36x8k	W
Available H3½	3½	4175	4½x5½	36x5	40x5d	W
Available H5	5	5375	5 x6	36x6	40x12	W
*Avery	1	....	3 x4s	34x5n	34x5n	1
Beck A Jr.	1¼	1285a	3½x5	32x4½n	32x4½n	1
Beck B-30	1½	2050	3¾x5	34x5	36x6	
Beck C-40	2	2150	3¾x5	36x6	36x6	
Beck D-50	2½	2850	4½x5¼	38x7	40x8	
*Bell (Penn.)	½	1000a	3½x5	31x4n	31x4n	B
Bell M (Iowa)	1	1495	3½x5½	35x5	35x5n	W
Bell E (Iowa)	1½	2100	3¾x5¼	34x3½	34x5	1
Bell O (Iowa)	2½	2550	4½x5½	34x4	34x6	1
Belmont A	½	725	3¼x4¼	31x4	31x4	B
Belmont D	2	2575	4¼x5½	34x3½k	34x6k	1
Belmont F	3	3500	4 x6	36x5k	36x5dk	1
Bessemer G	1	....	3½x5	35x5n	35x5n	1
Bessemer H-2	1½	....	3¾x5	36x3½k	36x5	1
Bessemer J-2	2½	....	4½x5¼	36x4	36x4d	1
Bessemer K-2	4	....	4½x5½	36x5	36x10	1
Bethlehem KN	1	1195	3½x5	34x4½n	35x5n	B
Bethlehem CN	2	1595	4 x6¼	34x4½k	34x6k	1
Bethlehem HN	3	2195	4 x5¼	36x4k	36x8k	1
Brinton C	1½	1500	3¾x5	34x4	34x5	W
Brinton D	2½	2250	4½x5¼	36x4	36x7	W
Brockway E	1	....	3¾x5½	35x5n	35x5n	B
Brockway S-5	1½	....	3¾x5	36x3½k	36x5k	W
Brockway SK	1½	....	4½x5¼	36x4	36x6	W
Brockway KR	2½	....	4½x5½	36x4	36x8	W
Brockway K-5	2½	....	4½x5¼	36x4	36x8	W
Brockway RT	3½	....	4¾x6	36x5	36x10	W
Brockway R-4	3½	....	4½x5½	36x5	36x5d	W
Brockway T-4	5	....	4¾x6	36x6	40x6d	W
*Buick	...	945b	3½x4¾	31x4n	31x4n	B
Capitol G1½	1½	2975	3¾x5	35x5	38x7	W
Capitol H2½	2½	3700	4¼x6	36x4	36x8	W
Capitol K2½	2½	4250	4¼x6	36x6	42x9	W
Capitol M3½	3½	4425	4¼x6	36x5	36x10	W
Case	2	....	4¼x5¾	36x6	38x7	1
*Chevrolet G	¾	745	3½x4	31x4n	34x4½n	B
*Chevrolet T	1	1125	3½x5¼	33x4n	35x5n	W
Chicago C1½	1½	....	4 x5	36x3½k	36x5k	W
Chicago C2½	2½	....	4 x5	36x4k	36x7k	W
Chicago C3½	3½	....	4½x5½	36x5	36x10	W
Chicago D5	5	....	4½x5½	36x6	40x12	W
Clydesdale 10	¾-1½	1485	3¾x5	34x5n	34x5n	B
Clydesdale 18	¾-1½	1890	3¾x5	34x5	34x5	W
Clydesdale 20	1-1½	2385	3¾x5	34x5	34x5k	W
Clydesdale 42	1½-2	2475	3¾x5	36x3½	36x6	W
Clydesdale 6SX	2½-3	3250	4½x5¼	36x4	36x8	W
Clydesdale 6SEX	2½-3	3450	4½x5½	36x4	36x8	W
Clydesdale 90	3½-4½	4100	4½x5½	36x5	36x10	W
Clydesdale 120	5-6	4500	4¾x6	36x6	40x12	W
Columbia H	1½	1895	4 x5	35x5	38x7n	I
Columbia G	2½	2335	4 x5½	36x4	36x7	I
Comet T	1½	1950	3¾x5	34x4	34x4	W
Commerce T	¾-1½	1450	3¾x5	34x4½n	34x4½n	B
Commerce 12	1½	1800	3¾x5	35x5n	35x5n	I
Commerce 16	2	2150	3¾x5	35x5n	36x6	I
Commerce 18	2½	2495	4½x5¼	36x6n	36x7n	I
Commerce 25	2½	2425	4½x5½	36x4	36x7	W
Cook 51	2½	3600	4 x5½	36x6n	40x8n	W
Corbitt E-22	1	1480	3¾x5	34x3½	34x4	W
Corbitt D-22	1½	2200	3¾x5	34x3½	34x4	W
Corbitt C-22	2	2600	4½x5¼	36x3½	36x6	W
Corbitt B-22	2½	3000	4½x5¼	36x4	36x7	W
Corbitt R-22	3	$3200	4½x5½	36x4	36x8	W
Corbitt A-22	3½-4	3800	4½x5½	36x5	36x10	W
Corbitt AA-22	5	4500	4¾x6	36x6	40x6d	W
Day-Elder AS	1	1600	3¾x5	35x5n	35x5n	W
Day-Elder B	1½	2000	3¾x5	34x3½	34x5	W
Day-Elder D	2	2400	4½x5¼	36x4	36x7	W
Day-Elder C	2½	2750	4¼x5½	36x4	36x7	W
Day-Elder F	3½	3150	4½x5½	36x5	36x5d	W
Day-Elder E	5	4250	4½x6	36x5k	40x6dk	W
Dearborn E	1	1600	3½x5½	35x5n	35x5n	W
Dearborn FX	1½	2300	3¾x5½	34x4	34x5	W
Dearborn F	1½	2180	3¾x5½	34x4	34x5	W
Dearborn 48	2	2590	3¾x5½	34x4½n	34x7	W
Defiance G	1	1695a	3¾x5	35x5n	35x5n	B
Defiance D	1½	2095a	3¾x5	35x5n	36x6n	I
Defiance E	2	2275a	3¾x5	35x5n	38x7n	I
Denby 31	1¼	1485	3½x5	35x5n	35x5n	B
Denby 33	1½	2145	3¾x5	35x5n	38x7n	I
Denby 34	2	2395	3¾x5	36x3½	36x6	I
Denby 35	2½-3	2795	4½x5¼	36x4	36x7	I
Denby 27	4	3895	4½x5½	36x5	36x5d	I
Denby 210	5	4295	4½x5½	36x6	40x6d	I
Dependable A	¾-1	1650	3½x5½	34x5n	36x6n	W
Dependable C	2	2350	3¾x5¼	34x3½	34x5	W
Dependable D	2½	2650	4 x5½	34x5	36x6	W
Dependable E	3	2950	4½x5½	36x4	36x7	W
Diamond T O-8	1-1½	1975	3¾x5¼	36x3½n	36x4n	W
Diamond T T	1½	2250	3¾x5¼	36x3½	36x5	W
Diamond T U	2-2½	2650	4 x5¼	36x4	36x7	W
Diamond T K	3½	3750	4¼x5½	36x5	36x5d	W
Diamond T EL	5	4325	4½x5½	36x6	40x6d	W
Diamond T S	5	4500	4¾x6	36x6	40x6d	W
*Diehl A	1	....	3½x5	34x4½	35x5	1
Diehl B	1½	....	3½x5	36x6	36x6	1
Doane	2½	4100b	4¼x5¾	36x5	36x7	C
Doane	3½	5100b	4¾x5¾	36x5	36x5d	C
Doane	6	6000b	5 x6¼	36x6	40x6d	C
*Dodge Brothers	½	730	3¾x4½	32x4n	32x4n	B
Dorris K-4	2-2½	3400	4¼x5½	36x4	36x7	W
Dorris K-7	3½	4400	4¼x5½	36x5	36x10	W
*Dort	½	685a	3½x5	31x4n	31x4n	B
Double Drive B	3	4000	4¼x5½	6	6	W
Duplex A	2	2775	4 x5¼	35x5n	38x7n	W
Duplex E	3½	3500	4¼x5½	36x8	36x8	I
Duty 22	2	1590	3½x5	34x3½	34x5	I
Eagle 101	1½	1875	3½x5½	34x5	34x5	I
Eagle 100-2	2	2275	3¾x5¼	34x4k	34x7k	I
F. W. D. B	3	4200	4¾x5½	36x6	36x6	B
Fageol 1½	1½	3000	3¾x5¼	34x3½k	34x6k	W
Fageol 2½	2½	3900	4¼x5¾	34x4	36x7	W
Fageol 3½	3½	5000	4½x6¼	36x5k	40x5dk	W
Fageol 5	5	5700	4½x6¼	36x6	40x6d	W
Fargo R	2	1700	3¾x5	36x4	36x6	1
Federal SD	1½	1800	3¾x5	35x5n	36x6n	W
Federal TE	1½	2175	4½x5¼	36x3½	36x5	W
Federal UE	2-2½	2425	4½x5¼	36x4	36x7	W
Federal WE	3½-4	3150	4½x5½	36x5	36x5d	W
Federal X2	5-6	4500	4¾x6	36x6	40x6d	W
*Ford TT	1	430	3¾x4	30x3½n	32x4½n	W
Front Drive C	1½	2800	3¾x5½	5	4	W
G & J** 20	1	2275	3½x5½	34x5n	34x5n	W
G & J** A	2-2½	3375	4x5¼	36x4	36x7	W
G & J** B	3½-4	4475	4½x5½	36x5	36x10	W
G.M.C. K16	1	1295	3½x5½	34x5n	34x5n	B
G.M.C. K-41A	2	2375	4 x5½	36x4k	36x7k	W
G.M.C. K-41B	2	2375	4 x5½	36x4k	36x7k	W
G.M.C. K-71A	3½	3600	4½x6	36x5	40x5d	W
G.M.C. K-71B	3½	3700	4½x6	36x5	40x5d	W
G.M.C. K-101A	5	3950	4½x6	36x5	40x6d	W
G.M.C. K-101B	5	4050	4½x6	36x5	40x6d	W
G.W.W.	1½	1850	3¾x5½	35x5	35x5	1
*Garford 15	¾	1590	3½x5½	34x5n	34x5n	W
Garford 25-B	1¼	1990	3¾x5½	36x6n	36x6n	W
Garford 70-H	2	2750	4¼x5½	36x4	36x7	W
Garford 77-D	3½	3750	4½x6	36x5	36x6d	W
Garford 68D	5	4500	5 x6½	36x6	40x6d	W
Garford 150-A	7½	5200	5½x6	36x6	40x7d	C
Gary F	1-1½	1675	3¾x5	36x3½	36x4	W
Gary I	2	2250	4 x5½	36x3½	36x6	W
Gary J	2½	2650	4¼x5½	36x4	36x8	W
Gary K	3½	3650	4½x6	36x5	40x5d	W
Gary M	5	4100	5 x6½	36x6	40x6d	W
Gersix M	1½	3100	4 x5½	36x3½	36x7	W
Gersix K	2½	3500	4½x5½	36x4	36x8	W
Gersix	3½	4500	4½x6	36x5	40x12	W
Graham Bros.	1	1265	3½x4½	33x4½n	34x5n	B
Graham Bros.	1½	1325	3½x4½	33x4½n	36x6n	B
1Gramm-Pion. 10	1	1365	3½x5	33x5n	33x5n	B
1Gramm-Pion. 15	1½	1900a	3¾x5	36x3½k	36x5k	1
1Gramm-Pion. 65	1½	2500a	3¾x5	36x3½k	36x5	W
1Gramm-Pion. 20	2	2925a	4¼x5¼	36x4k	36x7k	W
1Gramm-Pion. 30	3	3275a	4¼x5½	36x4k	36x4dk	W
1Gramm-Pion. 75P	3½	$4225a	4½x5½	36x6n	42x9n	W
1Gramm-Pion. 40	4	3995a	4½x5½	36x5	36x5dk	W
1Gramm-Pion. 50	5-6	4895a	4¾x6	36x6	40x6dk	W
Hahn B2	1	....	3½x5	34x5k	34x5k	W
Hahn O	1½	....	3¾x5¼	36x3½k	36x6k	W
Hahn K	2	....	4¼x5½	36x7k	36x8k	W
Hahn L	3	....	4½x5½	36x5k	36x8k	W
Hahn M	5	....	4½x5½	36x5	36x10	W
Hahn N	6	....	4¾x6	36x6	40x12	W
Hal-Fur E	1½	2350	4x5½	34x5n	38x7n	W
Hal-Fur B	2½	3000	4¼x5½	36x6n	36x8	W
Hal-Fur F	3½	4000	4½x5½	36x6n	40x10	W
Hall 1½	1½	3100	3¾x5	34x5n	38x7n	W
Hall 2½	2½	3275	4¼x5¼	36x4	36x6	W
Hall 3½	3½	4100	4½x5½	36x5	36x5d	W
Hall 5	5	5100	4½x5½	36x5	40x6d	W
Hall 7 chain	7	5100	4½x5½	36x5	40x6d	C
Harvey WOA	2	2650	4¼x5½	34x4	34x7	W
Harvey WFA	2½	2950	4¾x5½	36x4	36x7	W
Harvey WHA	3½	3950	4½x6	36x5	36x5d	W
Hawkeye K	1½	1850	3¾x5½	34x3½k	34x5k	I
Hawkeye M	2	2650	4¼x5	36x4k	36x6k	I
Hawkeye N	3½	3700	4½x6¾	36x5k	36x10k	I
Hendrickson O	1½	2200	3¾x5½	36x4n	36x5n	W
Hendrickson N	2½	2690	4¼x5¾	36x4k	36x7k	W
Hendrickson M	3½	3000	4¼x5	36x5k	36x5dk	W
Hendrickson K	5	4000	5 x6¼	36x6	40x6	W
Hurlburt A	1½	2850	4 x5½	34x4	34x5	W
Hurlburt B	2½	3750	4¼x5½	36x4	36x4d	W
Hurlburt C	3½	4590	4½x6	36x5	36x5d	W
Hurlburt D	5	5500	4½x6	36x5	40x6d	W
Indep'd't(Iowa) B	1	1665	3½x5	34x3½	34x4	I
Indep'd't(Iowa) G	1½	2040	3¾x5¼	34x3½	34x5	I
Indep'd't(Ia.) HI	2½	2940	4¼x5¾	36x4	36x4	I
Indep'd't(Ohio) F	1½	2385	3¾x5	36x3½	36x5	W
Indep'd't(Ohio) H	2½	3085	4½x5¼	36x4	36x4d	W
Indep'd't(Ohio) K	3½	3985	4½x5½	36x5	36x5d	W
Indiana 12	1½	....	3¾x5¼	34x3½k	34x5k	W
Indiana 20	2	....	4¼x5½	36x4k	36x7k	W
Indiana 25	2½	....	4¼x5½	36x4k	36x8k	W
Indiana 35	3½	....	4¾x5½	36x5k	36x5dk	W
Indiana 51	5	....	5 x6¼	36x5k	40x6dk	W
*International S	¾	1500	3½x5	34x5n	34x5n	1
International 21	1	1750	3½x5¼	36x3½	36x3½	I
International 31	1½	1850	3½x5½	36x3½	36x4	I
International 41	2	2100	3½x5¼	36x3½	36x5	I
International 61	3	2400	4¼x5	36x4	36x6	I
International 101	5	3600	4¾x5	36x5	40x10	I
Jackson 4WD	3½	3850	4½x5½	36x7	36x7	B
Jumbo 15	1½	2295	3¾x5¼	36x3½	36x5	I
Jumbo 20	2	2520	3¾x5¼	35x5n	38x7n	I
Jumbo 25	2½	2660	4½x5½	36x4	36x7	I
Jumbo 30	3	3060	4¼x5½	36x6n	42x9n	I
Jumbo 35	3½	3900	4½x6	36x5	36x10n	I
Jumbo 40	4	4400	4½x6	38x7n	44x10	I
K-Z 1	1	1750	3½x5	34x3½	34x5	W
K-Z 1½	1½	2075	3¾x5	36x4	36x6	W
K-Z 2½	2½	2550	4½x5¼	36x4	36x8	W
K-Z 3½	3½	3350	4½x5½	36x5	40x10	W
K-Z 5	5	3850	4½x5½	36x6	40x6d	W
Kalamazoo T	1	1295	4 x5	34x5	34x5n	B
Kalamazoo G-1	1½	2495	3¾x5	34x4	34x5	W
Kalamazoo LG	2	2645	4 x5	36x4	36x7	W
Kalamazoo NH	3	3145	4 x6	36x5	36x10	W
Kalamazoo HD	3	3350	4½x6	36x5	36x10	W
Kalamazoo LK	4	3845	4½x6	36x5	36x12	W
Kalamazoo OK	5	4350	4½x6	36x6	40x6d	W
2Kelly-S. K-31	1½	2700	3¾x5¼	36x3½	36x6	C
2Kelly-S. K-34	1½	2700	3¾x5¼	36x3½	36x6	W
2Kelly-S. K-38	2½	2900	3¾x5¼	36x4	36x4d	W
2Kelly-S. K-35	2½	2900	3¾x5¼	36x4	36x4d	C
2Kelly-S. K-40	3½	3900	4½x6½	36x5	40x5d	C
2Kelly-S. K-41	3½	3900	4½x6½	36x5	36x10	I
2Kelly-S. K-42	3½	3900	4½x6½	36x5	40x5d	W
2Kelly-S. K-50	5	4400	4½x6½	36x6	40x6d	C
2Kelly-S. K-60	6	4600	4½x6½	36x6	40x7d	C
Keystone	2	2175	3¾x5½	34x5n	38x7n	I
Kimball AB	2	3675	4 x6	36x4	36x7	W
Kimball AC	2½	3975	4¼x6	36x4	36x8	W
Kimball AK	3	4500	4½x6	36x4	36x10	W
Kimball AE	4	5000	4¾x6	36x5	40x12	W
Kimball AF	5	5500	5 x6	36x6	40x7d	W
*Kissel Express	1	1585	3¾x5½	34x5n	34x5n	W
Kissel Utility	1½	1975	3¾x5½	36x3½	36x5	W
Kissel Freighter	2½	2875	4¼x5½	36x4	36x7	W
Kissel H. D.	4	3675	4¼x5½	36x5	36x5d	W
Kleiber AA	1	2200	4¼x5¼	34x3½k	34x5k	W
Kleiber A	1½	3100	4¼x5¼	36x3½k	36x6k	W
Kleiber BB	2	3600	4¼x5¼	36x4k	36x7k	W
Kleiber B	2½	3950	4½x5½	36x5k	36x8	W
Kleiber C	3½	4600	4½x5½	36x5	36x5d	W
Kleiber D	5	5300	5 x6½	36x6	40x12	W
Koehler D	1½	2150	3½x5	34x3½	34x5	W
Koehler M	2½	3175	4 x5¼	36x4	36x7	W
Koehler MCS	2½	3275	4 x5½	36x4	36x7	W

FINAL DRIVE:—B—Bevel, C—Chain, D—Double Reduction, I—Internal Gear, W—Worm.
r—8 cyl. s—6 cyl. t—2 cyl.—all others are 4 cyl.
d—dual tires. k—pneumatic tires optional at extra cost. n—pneumatic tires. a—price includes several items of equipment. b—price includes body. *—speed truck or delivery wagon, **—Canadian Make. trac.—tractor.

1—Gramm-Pioneer. 2—Kelly-Springfield.

Specifications of Current Motor Truck Models—Continued

NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES Front	TIRES Rear	Final Drive
Koehler.....F	3½	$4470	4½x5½	36x5	36x10	W
Koehler,MT. Trac	5	3275	4 x5⅛	36x4	36x7	W
Krebs-Collier..23	¾	1260	3¾x5	34x4½	34x4½	B
Krebs-Collier..24	1	1565	3¾x5	34x5	34x5	W
Krebs-Collier..45	1½	2125	4½x5½	36x4	36x7	W
Krebs-Collier..75	2½	2375	4½x5½	36x4	36x8	W
Krebs-Collier..110	3½	2975	4½x5½	36x5	40x10	W
Larrabee.....X-2	1	1925	3¼x4½	34x5n	34x5n	B
Larrabee.....U	1½	2400	3¾x5	34x3½	34x5	W
Larrabee.....J	1½-2½	2400	3¾x5	34x3½k	34x5k	W
Larrabee.....K	2½	3100	4½x5½	36x4	36x7	W
Larrabee.....K-5	2½-3	3450	4½x5½	36x4	36x8	W
Larrabee.....L-4	3½	4000	4½x5½	36x5	36x5d	W
Larrabee.....W	5	4800	4¾x6	36x6	40x6d	W
Maccar.....L	1½	2700	4½x5¼	36x4	36x6	W
Maccar.....H-A	2	3400	4½x5¼	36x4	36x4d	W
Maccar.....H-2	3	3400	4½x5½	36x4	36x5d	W
Maccar.....H-3	4	4200	4½x5½	36x5	36x6d	W
Maccar.....G	5-6	4950	4¾x6	36x5	40x6d	W
MacDonald....A	7½	5750	5½x6	40x7	40x14	I
Mack...AB D.R.	1½	3150	4 x5	36x4	36x3½d	D
Mack...AB Chain	1½	3000	4 x5	36x4	36x3½d	C
Mack...AB Chain	2	3300	4 x5	36x4	36x4d	C
Mack.....AB D.R.	2	3750	4 x5	36x4	36x4d	D
Mack.....AB D.R.	2½	3850	4 x5	36x4	36x4d	D
Mack...AB Chain	2½	3400	4 x5	36x4	36x4d	C
Mack...AC Chain	3½	4950	5 x6	36x5	40x5d	C
Mack...AC Chain	5	5500	5 x6	36x6	40x6d	C
Mack...AC Chain	6½	5750	5 x6	36x6	40x12	C
Mack...AC Chain	7½	6000	5 x6	36x7	40x7d	C
Mack Trac....AB	5	3400	4 x5	36x4	36x4d	C
Mack Trac....AC	7	4950	5 x6	36x5	40x5d	C
Mack Trac....AC	10	5500	5 x6	36x6	40x6d	C
Mack Trac....AC	13	5750	5 x6	36x6	40x12	C
Mack Trac....AC	15	6000	5 x6	36x7	40x7d	C
Mapleleaf.....AA**	2	3775	4 x5½	36x4	36x7	W
Mapleleaf.....BB**	3	4350	4½x5½	36x4	36x4d	W
Mapleleaf.....CC**	4	5100	4½x5½	36x5	36x5d	W
Mapleleaf.....DD**	5	6200	4½x5½	36x6	40x6d	W
Master.....JW	1½	2290	4½x5½	34x3½	34x5	W
Master.....JD	1½	2590	4½x5½	34x3½	34x5	D
Master.....Z	2	2290	4½x5½	34x3½	34x5	W
Master.....W	2½	2800	4½x5½	34x4	36x7	W
Master.....DD	2½	3190	4½x5½	34x4	36x7	D
Master.....A	3½	3090	4½x6	36x5	40x5d	W
Master.....E	3½	4290	4½x6	36x5	40x5d	D
Master.....Y	4	4490	4½x6	36x5	40x6d	D
Master.....B	5	4990	4¾x6½	36x6	40x6d	W
Master.....F	5	5090	4¾x6½	36x6	40x6d	D
MasterTrac.,DDT	6	3399	4½x5½	34x4	36x7	D
*Maxwell.....1½	1½	932	3⅝x4½	32x3n	32x4n	W
*Menominee.....	1	1650	4 x5	34x5n	34x5n	W
Menominee...HT	1-1¼	2000	3¾x5	34x3½	36x5	W
Menominee.....H	1½	2175	4 x5	36x3½	36x5	W
Menominee.....D	2-2½	2875	4 x6	36x4	36x8	W
Menominee.....G	3½	3800	4½x6	36x5	36x10	W
Menominee...J-3	5	4250	4¾x6	36x6	40x12	W
Moline.....10	1½	1985	3½x5	34x5n	36x6n	I
3Moreland..R. R.	1	1595	4 x5	34x5n	34x5n	B
Moreland.....BX	1½	1980	4 x5	36x3½	36x6k	W
Moreland.....EX	2	2800	4½x5½	36x4	36x7k	W
Moreland.....AX	3	3500	4½x5½	36x5	36x10k	W
Moreland.....RX	4½-5	4600	4¾x6	36x6	40x6	W
Nash.....2018	1-1½	1595	3¾x5½	35x5	36x6	I
Nash.....3018	2-2½	2150	3¾x5½	36x6	40x8	I
Nash.....Quad	2-2½	2750	4½x5½	40x8	40x8	I
Nash..3018, LWB	2-2½	2200	3¾x5¾	36x6	40x8	I
Nash Quad. LWB	2-2½	2800	4½x5½	40x8	40x8	I
Nash.....5018	2½	2250	3¾x5½	34x4	34x6	I
4Nelson.....G2	1½	....	4½x5¼	36x3½	36x6	W
4Nelson.....G3	2½	....	4½x5¼	36x4	36x7	W
4Nelson.....G4	3½	....	4½x5½	36x5	36x5d	W
4Nelson.....G5	5	....	4¾x6	36x6	40x6d	W
Netco.....DK	2	3100	4½x5¼	36x4k	36x7k	W
Netco.....HL	2½	3500	4½x5½	36x4k	36x8k	W
Niles.....E	2	3000	4½x5½	36x4k	36x7k	W
Noble.....B30	1½	....	3¾x5¼	36x3½	36x5	W
Noble.....C40	2	....	4 x5½	36x4	36x7	W
Noble.....D50	2½	....	4½x5½	36x4	36x8	W
Noble.....E70	3½	....	4½x6	36x5	36x10	W
Northwestern..W	1½	2700	4½x5¼	34x4	36x6	W
Northwestern..WS	2½	3500	4½x5½	36x4	36x8	W
Norwalk.....25E	1	1595	3½x5	34x3½	34x4	W
Norwalk.....35E	1½	1925	3½x5	34x3½	34x3½d	W
Norwalk,35E.Spec	1½	2285	3¾x5¼	34x3½	34x5	W
Ogden.....A2	1	....	3½x5	34x5n	34x5n	W
Ogden.....D	1½	....	3¾x5	36x3½	36x5	W
Ogden.....E	2½	....	4½x5¼	36x4	36x8	W
Old Hickory...W	1	1775	3¾x5	36x3½k	36x4k	W
Old Reliable....A	1½	2350	4 x5	34x4	36x6	W
Old Reliable....B	2½	3500	4¼x6	34x4	36x4d	W
Old Reliable....C	3½	4250	4¼x6	36x5	36x5d	W
Old Reliable....D	5	5250	4¾x6	36x6	40x6d	W
Old ReliableKLM	7	6000	4¾x6½	36x6	40x7d	C

NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES Front	TIRES Rear	Final Drive
*Oldsmobile Econ	1	$1095	3½x5¼	35x5n	35x5n	I
Olympic.....A	2½	3200	4¼x5½	36x4	36x8	W
Oneida.....B9	1½	2825	4 x5¼	36x3½	36x7	
Oneida.....C9	2½	3200	4 x5¼	36x4	36x8	
Oneida.....D9	3½	4050	4½x5½	36x5	36x10	
Oneida.....E9	5	4725	4½x5½	36x6	40x12	
Oshkosh.....A	2	3250	3½x5	36x6n	36x6n	B
Oshkosh.....AA	2	3400	3½x5	36x6n	36x6n	B
Oshkosh.....B	2½	3850	4 x5⅛	38x7n	38x7n	B
Oshkosh.....BB	2½	4000	4 x5⅛	38x7n	38x7n	B
*Overland.....4	½	450	3½x4	30x3½n	30x3½n	B
Packard.....EC	1½-3	3100	4¼x5½	36x4	36x7	W
Packard.....EX	1½-3	3100	4¼x5½	36x6n	40x8n	W
Packard.....ED	2-4½	4100	4½x5½	36x5	36x5d	W
Packard.....EF	4-7½	4500	5 x5½	36x6	40x6d	W
Paige.....52-19	1½	1950	4 x5¼	34x3½	34x5	W
Paige.....54-20	2½	2420	4¼x5½	34x4	34x8	W
Paige.....51-18	3½	3145	4½x5½	36x5	36x5d	W
Parker.....C-22	1	1875	3¾x5¼	34x5n	34x5n	W
Parker.....G-22	2½	3200	4¼x6	34x4	36x4d	W
Parker.....J-20	3½	3950	4½x6	36x5	40x5d	W
Parker.....M-20	5	4850	5 x6	36x6	40x6d	W
Patriot....Revere	1	1380	3¾x5	35x5n	35x5n	W
Patriot....Lincoln	2	2050	4 x5¼	34x3½	34x5	W
Patriot .Washgt'n	3	2900	4½x5½	36x4	36x7	W
Pierce-Arrow.....	2	3200	4 x5½	36x4	36x4d	W
Pierce-Arrow.....	3½	4350	4½x6¾	36x5	36x5d	W
Pierce-Arrow.....	5	4850	4½x6¾	36x5	40x6d	W
Pittsburgher.....	1½-2	3000	3¾x5	36x4	36x6	..
Pittsburgher.....	3	3800	4½x5½	36x5k	36x8	W
Power.....F	2	3150	3¾x5½	36x5	36x7	W
Power.....C	3½	4250	4½x5½	36x5	40x10	W
*Rainier.....R-21	¾	....	3½x5	35x5n	35x5n	W
Rainier.....R-29	1	....	3¾x5	34x3½	34x4	W
Rainier.....R-26	1½	....	3¾x5	34x3½	34x5	W
Rainier.....R-28	2	....	4½x5½	34x4	34x6	W
Rainier.....R-20	2½-3	....	4½x5½	34x4	34x7	W
Rainier.....R-15	3½-5	....	4½x5½	36x5	36x5d	W
Rainier.....R-17	5-6	....	4¾x6	36x6	40x6d	W
Ranger..TK-20-2	1½	2450	3¾x5	36x6n	38x7n	W
*Reo.....F	¾-1½	1245	4½x4½	34x4½n	34x4½n	B
Reliance.....10A	1½	2400	4 x5⅛	36x3½	36x5	I
Reliance.....20B	2½	3100	4¼x5½	36x4	36x4d	I
Republic.....75	¾	1395b	3½x5	32x4½n	32x4½n	I
Republic.....10	1	1395	3¾x5	34x3	34x4	I
Republic..10 Exp	1	1695	3¾x5	35x5n	34x5n	I
Republic.....11X	1½	1795	3¾x5	34x3½	34x6	I
Republic.....19	2½	2195	4½x5¼	36x4	36x7	I
Republic.....20	3½	3095	4½x5½	36x5	36x10	I
Rowe.....CW	1½	3000	3¾x5	36x6n	36x6n	W
Rowe....C.D.W.	2	3300	4 x5	34x4	36x3½d	W
Rowe....G.S.W.	3	4150	4 x6	34x5	36x5d	W
Rowe....G.P.W.	3	5250	3½x5r	38x7n	42x9n	W
Rowe.....HW	4	4500	4¼x6	36x5	36x6d	W
Rowe.....F. W.	5	5500	4½x6	36x6	40x6d	W
Ruggles.....20	1	1195	3¾x5	34x5n	34x5n	B
Ruggles.....40	2	1795	4 x5	34x5n	34x7	D
Sanford W-15	1½	2150b	3¾x5	36x3½k	36x5k	..
Sanford.....25	2½	....	4½x5¼	36x4	36x4d	W
Sanford.....35	3½	....	4½x5½	36x5	36x5d	W
Sanford.....50	5	....	4¾x6	36x5	40x6d	W
Schacht....2-Ton	2	3200	4¼x5½	36x4	36x7	W
Schacht....3-Ton	3	3800	4½x5½	36x5	36x5d	W
Schacht....4-Ton	4	4200	4½x6	36x5	40x5d	W
Schacht....5-Ton	5	4400	4½x6	36x5	40x6d	W
Schacht....7-Ton	7	5050	4½x6	36x6	40x7d	W
Schwartz.....A	1	1685	3½x5	34x4½n	34x4½n	B
Schwartz.....K	2	3000	3¾x5¼	34x3½	34x7	W
Schwartz.....L	3	3600	4¼x5½	36x4	36x8	W
Schwartz.....M	5	4900	4½x6	36x6	40x12	W
Selden.....30	1½	2250	3¾x5	34x3½	34x5	W
Selden.....31	1½-2½	3350	4¼x5¼	34x5	38x7	W
Selden.....50	2½	3250	4¼x5¼	36x4	36x7	W
Selden.....51	2½-3½	4350	4½x5½	36x6n	40x8n	W
Selden.....70	3½-5	3750	4½x5½	36x5	36x10	W
Selden.....90	5-7	4950	4¾x6	36x6	40x12	W
Seneca.....M	½	820	3½x4½	30x3½n	30x3½n	B
*Service.....12	¾	....	3¼x4½	32x4½n	32x4½n	B
*Service.....15	1¼	....	3½x5	34x4½n	35x5n	B
Service.....21	1½	....	3½x5½	34x3½	34x5	W
Service.....32	2	....	4 x5½	36x3½	36x7	W
Service.....37	2	....	4¼x5½	35x5n	38x7n	W
Service.....52	3	....	4¼x5½	36x4	36x8	W
Service.....72	3½	....	4¼x5½	36x5	36x5d	W
Service.....77	4	....	4½x6	36x5	36x5d	W
Service.....102	6	....	4½x6	36x6	40x6d	W

FINAL DRIVE:—B—Bevel, C—Chain, D—Double Reduction, I—Internal Gear, W—Worm.
r—8 cyl. s—6 cyl. t—2 cyl.—all others are 4 cyl. d—dual tires. k—pneumatic tires optional at extra cost. n—pneumatic tires. a—price includes several items of equipment. b—price includes body. *—speed truck or delivery wagon. **—Canadian Make. trac.—tractor.

NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES Front	TIRES Rear	Final Drive
Signal.....NF	1	$1950	3¾x5	34x5n	36x6n	W
Signal.....H	1½	2450	4½x5¼	34x4	36x6	W
Signal.....J	2½	2875	4½x5¼	34x4	36x8	W
Signal.....M	3½	3675	4½x5½	36x5	40x5d	W
Signal.....R	5	4400	4¾x6	36x6	40x6d	W
Southern.....10	1	2090	3¾x5	34x3½	34x4	W
Southern.....15	1½	2590	3¾x5⅛	36x6n	34x4	W
Southern.....20	2	2990	4¾x5¼	36x6n	40x8k	W
*Standard.....75	1¼	1330	3¾x5	33x5n	33x5n	W
Standard.....1-K	1½	1600	3¾x5	34x3½k	34x5k	W
Standard.....76	2½-3	2400	4½x5¼	36x4k	36x7k	W
Standard.....66	3½-5	3150	4½x5½	36x5	36x10	W
Standard.....5-K	5-7	4400	4¾x6	36x6	40x12	W
Sterling.....1½	1½	2885	4 x5¼	36x3½k	36x5k	W
Sterling.....2	2	3085	4 x5¾	36x4k	36x6k	W
Sterling.....2½	2½	3290	4½x5¾	36x4k	36x4dk	W
Sterling.....3½	3½	4325	4½x6½	36x5k	40x5dk	W
Sterling.....5-W	5	4950	5 x6¼	36x6	40x6d	W
Sterling.....5-C	5	5500	5 x6¼	36x6	40x6d	C
Sterling.....7½	7½	6000	5 x6¼	36x6	40x7d	C
*Stewart.....14	¼-1½	1245	3¾x5½	34x4½n	34x4½n	I
Stewart.....15	1½-1½	1445	3¾x5½	35x5n	35x5n	I
Stewart.....9	1½-2	1790	3¾x5	34x3½	34x5	I
Stewart.....7	2-2½	2190	4¼x5¼	34x4	34x7	I
Stewart.....7-X	2½-3	2390	4¼x5½	34x4	34x7	I
Stewart.....10	3½-4	3190	4½x5½	36x5	36x5d	I
Stewart.....10-X	3½-4	3190	4½x6	36x5	36x5d	I
*Stoughton.....C	¾	1240	3½x5	34x4½n	34x4½n	W
Stoughton.....A	1	1790	3¾x5¼	34x5	34x5	W
Stoughton.....B	1½	2150	3¾x5¼	36x3½	36x5	W
Stoughton.....D	2	2490	4 x5½	36x4	36x7	W
Stoughton.....F	3	3150	4¼x5½	36x5d	36x5d	W
Sullivan.....E	2	2800	4¼x5½	36x4k	36x7k	W
Sullivan.....H	3½	3750	4½x6	36x5	36x5d	W
*Thomart.....	1¼	1795a	4 x5¼	34x5	34x5	C
Tiffin.....GW	1½	2100	4½x5¼	36x3½	36x5	W
Tiffin.....MW	2½	2700	4½x5¼	36x4	36x3½d	W
Tiffin.....PW	3½	3600	4½x5½	36x5	40x5d	W
Tiffin.....F50	5	4300	4¾x6	36x6	40x6d	W
Tiffin.....F60	6	4500	4¾x6	36x6	40x12	W
Titan.....2	2	2750	4 x5	36x4k	36x7k	D
Titan.....3	2½	2950	4¼x5½	36x4k	36x8k	D
Titan.....3½	3½	3950	4½x6	36x5k	40x10k	D
Titan.....5	5	4550	4½x6	36x6	40x12	D
Tower.....J	1½	2900	4½x5¼	35x5	38x7	W
Tower.....H	2½	3200	4½x5¼	36x4	36x7	W
Tower.....G	3½	4100	4½x5½	36x5	36x5d	W
Traffic.....	1½	1595	3¾x5	35x5n	35x5n	I
Traffic.....C	2	1595	3¾x5	34x3½k	34x5k	I
Traffic.....	3	1895a	3¾x5	36x4	36x7	I
*Transport....15	1	1295	3¾x5	32x4½n	32x4½n	B
Transport.....25	1½	1495	3¾x5½	34x3½k	34x4k	I
Transport.....35	2	1885	3¾x5	36x3½k	36x6k	I
Transport.....55	3	2385	4½x5¼	36x4k	36x8k	I
Transport.....60	3½	2585	4¼x5½	36x4k	36x8k	I
Transport.....75	5	3485	4½x6	36x5k	36x12k	I
Traylor.....B	1½	2390	3¾x5½	34x3½	34x5	W
Traylor.....C	2-2½	2850	4 x5½	36x4	36x7	W
Traylor.....D	3-3½	3300	4¼x5½	36x4	36x8k	W
Traylor.....F	5-6	4700	4½x6	36x6	40x6d	W
*Triangle.....AA	1	1285	3¼x5	34x4½n	34x4½n	I
Triangle.....A	1½-2	1985	3¾x5¼	34x3½k	34x6k	I
Triangle.....C	2-2½	2285	3¾x5¼	36x4k	36x6k	I
Triangle.....B	2½-3	2585	4 x5¾	36x4k	36x7k	I
Twin City...B.W.	2	2750	4 x5½	36x6	40x8	I
Twin City...A.W.	3½	3950	4¼x6	36x5	40x5d	W
5Twin City.....B	3½	....	5½x6	36x6	36x6	I
5Twin City.....A	5	....	5½x6	36x7	36x7	I
Ultimate.....A	2	3150	4 x5½	36x3½	36x6	W
Ultimate.....AJ	2	3200	4¼x5½	36x3½	36x6	W
Ultimate.....AJL	2	3250	4¼x5½	36x3½	36x6	W
Ultimate.....B	3	3700	4¼x5½	36x4	36x4d	W
Ultimate.....BL	3	3800	4¼x5½	36x4	36x4d	W
Ultimate.....D	5	5500	5 x6½	36x6	40x12	W
Union.....FW	2½	3190	4 x6	36x5k	36x8k	D
Union.....HW	4	4650	4½x6	36x6	40x12	D
Union.....JW	6	5800	5 x6	36x6	40x14	D
United.....A	1½	2445	3¾x5¼	36x3½k	34x5k	W
United.....B	2½	3150	4¼x5½	36x4k	36x7k	W
United.....C	3½	3975	4¼x5½	36x5	36x8d	W
United.....V	5	4500	4½x6	36x6	40x6d	W
*United States..U	1½	1875	3¾x5½	34x5n	34x5n	B
UnitedStates,NW	1½	2225	3¾x5	36x5	36x3½	W
United States...N	1½	1975	3¾x5	36x3½k	36x5k	I
United States...R	3	3075	4 x5¼	36x4	36x4d	W
United States...S	4	3875	4½x5½	36x5	36x5d	W
United States...T	6	4850	4¾x6½	36x6	40x6d	W
Velie.....46	1½	1585	3¾x5	36x3½k	36x5k	I
Veteran.....M**	1½	2699	3¾x5¼	35x5n	35x5n	W
Veteran.....P**	2	3699	4¼x5½	36x4	36x7	W
Veteran.....R**	3	4200	4¼x5½	36x4	36x7	W
Veteran.....S**	4	5395	4½x6	36x5	36x10	W
*Vim.....29	½	1050	3½x4½	31x4n	31x4n	W
Vim.....30	½	1175	3½x4½	32x4½	32x4½	W
Vim.....31	1	1975	3¾x5½	35x5n	35x5n	W
Vim.....22	2	3150	3¾x5½	36x4	36x6	W
Vim.....23	3	3050	4¼x5½	36x5	36x5d	W

3—Moreland Road Runner. 4—Nelson Le Moon. 5—Twin City Four Wheel Drive.

Specifications of Current Motor Truck Models—Continued

NAME AND MODEL	Tons Capacity	Chassis Price	Bore and Stroke	TIRES Front	TIRES Rear	Final Drive
Walker-JohnsonA	2	$2250	3¾x5	34x3½	34x6	W
Walker-JohnsonB	3	2750	4½x5½	36x4	36x8	W
Walter.....S	5	4850	4½x6½	36x6	40x6d	W
*Watson.....B	1	1865a	3¾x5½	35x5n	35x5n	W
Watson.....N	3½	4250	4½x5½	36x5	36x10	W
Western....W1½	1½	2550	4½x5½	36x3½k	36x5k	W
Western....L1½	1½	2550	3¾x5	36x3½k	36x5k	W
Western....W2½	2½	3250	4½x5½	36x4	36x7	W
Western....L2½	2½	3250	4½x6	36x4	36x7	W
Western....W3½	3½	4250	4½x6	36x5	40x5d	W
*White.....15	¾	2400	3¾x5½	34x5n	34x5n	B
White.....20	2	3250	3¾x5½	36x4k	36x7	D
White.....40	3½	4200	3¾x5¾	36x5	40x5d	D
White.....45	5	4500	4½x5¾	36x6	40x6d	D
White Hick....E	1	1225	3¾x5	34x5n	34x5n	W
White Hick....H	1½	1375	3¾x5	36x3½	36x5	W
White Hick....K	2½	1675	4½x5¼	36x4	36x5	W
Wichita.....K	1	1875	3¾x5¼	36x3½	36x4k	W
Wichita.....M	2	$2400	3¾x5¼	36x3½k	36x6k	W
Wichita.....RX	3	3200	4¾x5¾	36x4k	36x8k	W
Wichita.....O	4	3500	4½x6½	36x5k	36x5k	W
Wilcox.....AA	1	1900	3¾x5½	36x4k	36x4k	W
Wilcox.....BB	1½	2550	4¼x5	36x4	36x5	W
Wilcox.....D	2½	3000	4¼x5	36x4k	36x3½dk	W
Wilcox.....E	3½	3950	4½x6	36x5k	36x5dk	W
Wilcox.....F	5	$4350	4¾x6½	36x5	40x6d	W
Wilson.....F	1½	2270	3¾x5	36x3½	36x5	W
Wilson.....EA	2½	2825	4½x5¼	36x4	36x7	W
Wilson.....G	3½	3685	4½x5½	36x5	36x5	W
Wilson.....H	5	4520	4¾x6	36x6	40x6	W
*Wisconsin.....A	1	1750	3¾x5	34x5n	34x5n	W,B
Wisconsin.....B	1½	2100	3¾x5	35x5	36x6	W
Wisconsin.....C	2½	2700	t x5¾	36x6n	36x7	W
Wisconsin.....D	3½	3000	4¾x5¾	36x6n	40x8	W
Wisconsin.....E	5	3500	4½x6½	36x6	36x10	W
Wisconsin.....F	7	4000	5 x6¼	36x6	36x12	W
Witt-Will.....N	1½	2250	3¾x5	36x3½k	36x5k	W
Witt-Will.....P	2½	2750	4½x5¼	36x3½k	36x7k	W
Wolverine.....J	1	2125	3½x5	34x3	34x4	I
Wolverine.....J	1½	2375	3¾x5	34x3½	34x5	I
Wolverine.....J	2	2640	3¾x5	34x4	34x7	I
Wolverine.....J	2½	3425	4½x5¼	36x5	36x10	I
Wolverine.....L	3½	4100	4½x5½	36x5	36x10	I

FINAL DRIVE:—B—Bevel, C—Chain, D—Double Reduction, I—Internal Gear, W—Worm. r—8 cyl. s—6 cyl. t—2 cyl.—all others are 4 cyl. d—dual tires. k—pneumatic tires optional at extra cost. n—pneumatic tires. a—price icludes several items of equipment. b—price includes body. *—speed truck or delivery wagon. **—Canadian Make. trac—tractor.

Specifications of Current Farm Tractor Models

TRADE NAME	Rating	Price	Wheels or Crawlers	Engine	Cylinders: Bore, Stroke	Fuel	Plow Capacity
Allis-Chal.G.P	6-12	$250	2	LeR.	4-3½x4½	Gas.	1
Allis-Chalm.	15-25	1185	4	Midw.	4-4½x5½	Gas.	3
Allis-Chalm.	20 35	1885	4	Own	4-4¾x6½	GorK	3-4
‡Allis-Chalm.	20-35	2085	4	Own	4-4¾x6½	G	4
Allwork...2-G	14-28	1095	4	Own	4-4¾x6	GorK	3
Allwork.....C	14-28	1395	4	Own	4-5 x6	GorK	3
AndrewsKin.D	18-36	2500	4	Clim.	4-5 x6½	GorK	4
ARO .1921-22	3-6	385	4	Own	1-4½x5	Gas.	1
Aultman-T....	15-30	2200	4	Clim.	4-5 x6½	G,K	4
Aultman-T....	22-45	3420	4	Own	4-5½x8	G,K	6
Aultman-T....	30-60	4500	4	Own	4-7 x9	G,K,D	7-10
Automot. B-3.	12-24	1250	4	Herc.	4-4 x5⅛	Gas.	2-3
Avery,SR.Cul.	5-10	....	4	Own	4-3 x4	G,K	..
Avery..Cult-C	....	....	3	Own	6-3 x4	G,K	..
Avery.....B	5-10	....	4	Own	4-3 x4	G,K	2
Avery.....C	....	....	4	Own	6-3 x4	G,K	..
Avery.....	8-16	....	4	Own	2-5½x6	G,K,D	2-3
Avery.....	12-20	....	4	Own	4-4½x6	G,K,D	3-4
Avery.....	....	....	*	Own	4-4x5½	G,K,D	3
§Avery.....	12-25	....	4	Own	2-6½x7	G,K,D	3-4
Avery.....	14-28	....	4	Own	4-4½	G,K,D	3-4
Avery.....	18-30	....	4	Own	4-5½x6	G,K,D	4-5
Avery.....	25-50	....	4	Own	4-6½x7	G,K,D	5-6
Avery.....	45-65	....	4	Own	4-7¼x8	G,K,D	8-10
Bates Mule.H	15-25	....	4	Midw	4-4½x5¼	Gas.	3
Bates Mule..F	18-25	....	*2	Midw	4-4½x5¼	Gas.	3
‡Bates MuleG	25-35	....	*2	Midw	4-4½x6	Gas.	..
Beeman,....G	2-4	240	4	Own	1-3½x4½	Gas.	..
Best.....	18-30	3107	*2	Own	4-4¾x6½	G,K,D	4
Best.....	60	5457	*2	Own	4-6½x8½	G,K,D	8-9
Boring.....	5-10	395	4	LeR.	4-3½x4½	G	..
Boring...1921	.....	1850	3	Wauk	4-4⅜x5¾	GorK	2
Burn-Oil, 1922	15-30	1435	4	Own	2-6¾x7	Ker.	3-4
Capital.....	15-30	1000	2	Own	4-4⅛x6	Gas.	3
Case.....	12-20	1050	4	Own	4-4½x5	G,K,D	3
Case.....	15-27	1320	4	Own	4-4½x6	GorK	3-4
Case.....	22-40	2550	4	Own	4-5½x6¾	GorK	4-5
Case....40-72	40-72	5200	4	Own	7 x8	G,K,D	8-10
Caterpillar .5T	25	....	*2	Own	4-4¾x6	Gas.	4
Caterpillar 10T	40	....	*2	Own	4-6½x7	Gas.	6
Caterpillar T35	15-25	....	2	Own	4-4 x5½	Gas.	3
Centaur.....	5-21½	345	2	N Way	2-4½x4½	GorK	1
Chicago....40	40	2500	4	Own	4-4½x6	Gas.	4
Cletrac.....F	9-16	595	*2	Own	4-3¼x4½	G,K,D	2
Cletrac.....W	12-20	1345	*2	Own	4-4 x5½	G,K,D	2-3
Dakota.....4	15-27	1500	3	Dom,	4-4¾x6	Gas.	3
Depue.....A	20-30	2500	4	Buda	4-4½x6	Gas.	4
Dill.....D	20	2380	4	Cont.	4-4½x5½	Gas.	3
Dill.....R.W.	20	2980	4	Midw.	4-4½x6	Gas.	3
Do-it-All....A	3-6	495	..	Own	1-4½x5	Gas.	1
Eagle.....F	12-22	....	4	Own	2-7 x8	GorK	3-4
Eagle.....H	16-30	....	4	Own	2-8 x8	G or K	4-5
E-B.....AA	12-20	1095	4	Own	4-4¾x5	G,K,D	3
Fageol.....D	9-18	1525	4	Lyc.	4-3½x5	Gas.	2
Farm Horse.B	18-30	1885	4	Clim.	4-5 x6½	G,K	4
Farquhar....	15-25	....	4	Buda	4-4½x6	G,K,D	3-4
Farquhar.....	18-35	....	4	Own	4-6 x8	G,K,D	4-5
Farquhar.....	25-50	....	4	Own	4-7 x8	G,K,D	6-7
Fitch..4 Drive	20-35	1850	4	Clim.	4-5 x6½	GorK	3-4
Fordson.....	-18	$ 395	4	Own	4-4x5	G,K	2
Franklin....G	18-30	4000	*2	Clim.	4-5 x6½	G or K	3-4
Franklin....C	18-30	3350	*2	Clim.	4-5 x6½	G or K	3 4
Franklin...G2	18-30	4350	2	Clim.	4-5 x6½	G or K	3-4
Frick.....A	12-20	....	4	Erd.	4-4 x6	G,K	2-3
Frick.....C	15-28	....	4	Beav.	4-4¾x6	G,K	3-4
Grain Belt,..A	18-36	2150	4	Wauk.	4-4¾x6¾	G or K	4
Gray.....1920	18-36	....	3	Wauk	4-4¾x6¾	Gas,	4
Gt. Western St	20-30	1950	4	Beav.	4-4¾x6	K	4
Hart-Parr..20	20	765	4	Own	2-5¼x6½	K,D.	2
†Hart-Parr..30	30	895	4	Own	2-6½x7	K,D.	3
†Hart-Parr....	....	1695	4	Own	6½x7	K.D.	..
Heider.....D	9-16	870	4	Wauk	4-4½x5¾	G,K	2
Heider.....C	12-20	995	4	Wauk	4-4½x6¾	G,K	3
Heider...Cult	5-10	800	4	LeR.	4-3½x4½	Gas.	1
Huber Light 4.	12-25	1185	4	Wauk	4-4½x5¾	G or K	3
Huber Super 4	15-30	1885	4	Midw.	4-4½x6	Gas	3
Illinois,....C	15-30	....	4	Clim.	4-5 x6½	G,K	4
Imperial....E	40-70	4500	4	Own	4-7½x9	G,K,D	10
Indiana....F	5-10	665	2	LeR.	4-3½x4½	Gas.	1-2
International .	8-16	†670	4	Own	4-4¼x5	G,K,D	2
Internatl.Titan	10-20	†700	4	Own	2-6½x8	G,K,D	3
International..	15-30	1750	4	Own	4-5¼x8	G,K,D	4
J-T.....N	20-40	....	*2	Clim.	4-5x6½	G,K,D	3-4
La Crosse....	12-24	985	2	Own	2-6 x7	G,K	3
Lauson.....5	12-25	1295	4	Midw.	4-4½x5¼	Gas.	3
Lauson.....21	15-30	1675	4	Beav.	4-4¾x6	G or K	3-4
‡Lauson Road	15-30	2000	4	Beav.	4-4¾x6	K	....
Leader.....B	12-18	685	4	Own	2-6 x6¼	G,K,D	2-3
Leader.....N	16-32	1725	4	Clim.	4-5 x6½	G,K	3-4
‡Leader...GU	18-35	2150	*2	Clim.	4-5 x6½	G,K	3-4
Linn.....H4J	40-	4500	*	Cont.	4-4½x5½	Gas	4
Linn.....W	60	5000	*	Wauk	4-5 x6¼	Gas	6
Little Giant, B	16-22	2200	4	Own	4-4½x5	K	4
Little Giant, A	26-35	3300	4	Own	4-5½x6	K	6
Lombard..1922	85-150	8950	*2	Wisc.	6-5½x6¾	Gas.	16
Lombard..1922	50	5300	*2	Wisc.	4-4¾x6½	Gas.	6-10
Master Jr.....	5-10	585	..	LeR.	-2¾x4	Gas.	1
MerryGar1922	2	210	2	Evin	1-2¾x2½	Gas.	..
Minne...All-P	12-25	800	4	Own	4-4½x7	G or K	3
Minne. Gen.P	17-30	1600	4	Own	4-4¾x7	G or K	3-4
Minne. Med.D	22-44	2650	4	Own	4-6 x7	G or K	5-6
MinneHeavyD	35-70	3850	4	Own	4-7¼x9	G or K	8-9
Mohawk .1922	8-16	650	2	Light	4-3¼x4½	K or G	1-2
Moline Univ D	9-18	....	2	Own	4-3½x5	Gas.	2-3
Moline Orch..	9-18	....	2	Own	4-3½x5	Gas.	2-3
Motor Macult,	1½	195	2	Own	1-2¾x3½	Gas.	..
NB.....1	3-6	425	4	Own	2-3¾x4	Gas.	1
Nichols-Shep.	20-42	2650	4	Own	8 x10	G or K	3-6
Nichols Shep.	25-50	3000	4	Own	9 x12	G or K	4-7
Nilson Senior..	20-40	1975	5	Wauk	4-5 x6¼	G,K.	4
Oil Pull.....K	12-20	....	4	Own	2-6 x8	K,D	3
Oil Pull.....H	16-30	....	4	Own	2-7 x8½	K,D	4
Oil Pull ....G	20-40	....	4	Own	2-8 x10	K,D	5-6
Oil Pull.....E	30-60	....	4	Own	2-10x12	K,D	8-10
Oldsmar GarK	2½-5	225	4	Own	1-5½x5½	Gas.	1
Peoria.....L	12-25	$1690	4	Clim.	4-5 x6½	G,K	3
Pioneer.....G	18-36	1750	4	Own	4-5½x6	G,K,D	4
Pioneer.....C	40-75	3550	4	Own	4-7 x8	Gas.	10
Plowman.....A	15-30	1295	4	Buda	4-4½x6	G,K	3-4
Reliable.....	10-20	300	4	Own	2-6 x7	Ker.	2
Rex.....	12-25	1600	4	Wauk	4-4½x5¾	G or K	3
Russell.....	12-21	1500	4	Own	4-4¼x5¾	G or K	2-3
Russell.....	15-30	2200	4	Own	4-5 x6½	G or K	3-4
Russell.....	20-35	3000	4	Own	4-5½x7	G or K	4-5
Russell.....	30-60	5000	4	Own	4-8 x10	G or K	8-10
Samson....M	....	445	4	Own	4-4 x5½	G,K	2
Sandusky,....J	10-20	1250	4	Own	4-4½x5¼	G,K,D	2
Sandusky...E	15-35	1750	4	Own	4-5 x6½	G,K,D	4
Shelby.....D	15-30	....	4	Beav.	4-4¾x6	G,K	3
Shelby.....C	9-18	....	4	Wauk	4-3¾x5¼	G or K	2
Steady Pull..	12-21	1485	4	Own	4-4 x5	Gas.	3
Stinson....4E	18-30	1835	4	Beav.	4-4¾x6	G,K	4
Tioga.....3	18-32	....	4	Wisc.	4-4½x6	Gas.	3-4
Toro Cultivator	6	750	3	LeR	4-3½x4½	Gas.	2
ToroTractor'22	6-10	495	3	LeR	4-3½x4½	Gas.	2
Townsend....	10-20	800	2	Own	4-6½x7	Ker.	2-3
Townsend....	15-30	1350	2	Own	4-7 x8	Ker.	3-4
Townsend....	25-50	2500	2	Own	4-8½x10	Ker.	4-8
Traction Motor	40-50	....	4	....	8-3½x5	Gas.	4-5
Traylor....TB	6-12	500	4	LeR.	4-3½x4½	Gas.	1-2
Trundaar....10	25-40	3750	*2	Wauk	4-5 x6¼	G or K	4
Twin City.....	12-20	1200	4	Own	4-4½x6	G,K	3
Twin City.....	20-35	2750	4	Own	4-5½x6¾	G,K	5-6
Twin City.....	40-65	4750	4	Own	4-7¾x9	G,K	8-10
Uncle Sam C20	12-20	1295	4	Weid.	4-4 x5½	G	2-3
Uncle Sam B19	20-30	1985	4	Beav.	4-4¾x6	G or K	3-4
Uncle Sam D21	20-30	1895	4	Beav.	4-4¾x6	G or K	3-4
Utilitor....501	2½-4	295	4	Own	1-3½x4½	G	1
Utilitor...501A	2½-4	340	4	Own	1-3½x4½	G	1
Wallis.....K	15-25	†995	4	Own	4-4½x5¾	G,K	3
Waterloo....N	12-25	675	4	Own	2-6½x7	Ker.	3
Wetmore 21-22	12-25	1185	4	Wauk	4-4 x5¾	G,K	3
Whitney....D	9-18	595	4	Own	2-5½x6½	Gas.	2
Wichita.....T	15-30	2000	4	Beav.	4-4½x6	G,K,D	3-4
Wisconsin...E	16-30	1850	4	Clim.	4-5 x6½	G or K	3
Wisconsin...F	20-40	2050	4	Wauk	4-5 x6½	G or K	4
Wisconsin,..H	22-40	2550	4	Clim.	4-5½x7	G or K	4-6
Yuba....12-20	12-20	2400	*2	Wisc.	4-4½x6¾	G,K,D	3
Yuba....15-25	15-25	2750	*2	Wisc.	4-4½x6	G,K,D	..
Yuba....20-35	20-35	3900	*2	Wisc.	4-5¾x7	G,K,D	4
Yuba....25-40	25-40	4250	*2	Wisc.	4-5¾x7	G,K,D	..
‡Yuba.....	25-40	4750	*2	Yuba	4-5½x7	D	..
Zelle.....	12-25	....	4	Buda	4-4½x5½	G or K	3

ABBREVIATIONS: G—Gasoline. K—Kerosene. D—Distillate. Plow capacity varies in relation to operating conditions. Figures are based on 14 in. plows. Engine Make: Beav. —Beaver. Clim.—Climax. Cont.—Continental. Dom.—Domas. Evin.—Evinrude. Herc.—Hercules. LeR.—LeRoy. Midw.—Midwest. Nway.—New Way. Nor.—Northway. T.C.—Twin City. Wauk.—Waukesha. Weid.—Weidely. Wis.—Wisconsin. *—Crawler type. All others are wheel type. †Price includes plows. §Track Runner. ‡Industrial Tractor.

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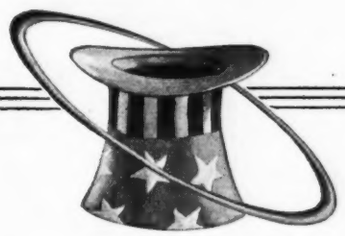

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Specifications of Current Passenger Car Models

NAME AND MODEL	Engine Make	Cylinders, Bore and Stroke	WB	Tires	2-Pass.	5-Pass.	7-Pass.	Coupe	Sedan
Ace F	G-B	4-3½x5	114	32x4	$1295	$1295	....	....	$2295
Ace L	H-S	6-3¼x5	117	32x4	2260	2260	....	....	3680
Ace C	Cont.	6-3⅝x5¼	123	33x4½	2975	2975	....	....	4500
Ambassador R	Cont.	6-3⅝x5¼	136	33x5	....	b1500	$4500	....	6500
American C	H-S.	6-3¼x5	127	33x4½	b1995	1850	1925	....	2695
Anderson Series 40	Cont.	6-3¼x4½	120	33x4	2195	1650	1795	$2450	2550
Apperson 8-21-S	Own.	8-3¼x5	130	34x4½	....	2620	2645	3625	3695
Auburn 6-51	Cont.	6-3¼x4½	121	32x4	1575	1575	1615	2275	2395
Bell 4-32	H-S.	4-3½x5	114	31x4	1095	1095	....	....	....
Bell 6-50	H-S.	6-3¼x5	124	32x4	1545	1545	....	....	....
Biddle B1 & B5	Buda.	4-3⅞x5⅛	121	32x4	2950	b2950	....	3950	3950
Brewster 91	Own.	4-4 x5½	125	32x4½	5000	5000	....	....	7000
Buick 1922-31-35-36-37	Own.	4-3⅜x4¾	109	31x4	895	935	....	1295	1395
Buick 1922-41-5-6-7	Own.	6-3⅜x4½	118	33x4t	1365	1395	....	1885	2165
Buick 1922-48-9-50	Own.	6-3⅜x4½	124	34x4½	n1785	n1785	1585	2075	2375
Cadillac 61	Own.	8-3⅛x5⅛	132	33x5	3100	3150	3150	d3875	4100
Case X	Cont.	6-3¼x4½	122	32x4½	....	1890	....	....	2790
Case V	Cont.	6-3½x5¼	126	34x4½	....	....	1935	2585	2993
Chalmers 1922	Own.	6-3¼x4½	117	32x4	1345	1395	1495	1995	2295
Chalmers 1922	Own.	6-3¼x4½	122	32x4	....	....	1495	....	....
Chandler Six	Own.	6-3½x5	123	33x4	1595	1595	1695	2295	2395
Chevrolet 490	Own.	4-3⅛x4	102	30x3½	525	525	....	850 k720	875
Chevrolet FB	Own.	4-3⅛x5¼	110	32x4	975	975	....	1575	1575
Cleveland 41	Own.	6-3 x4½	112	32x4	1175	1195	....	1550	1595
Cole 890	Sport.	8-3½x4½	127¼	33x5	2485	b2485	2485	3185	3685
Columbia Challenger	Rut.	6-3⅛x5	115	32x4	....	1195	....	1995	1995
Columbia DeLuxe	Cont.	6-3¼x4½	115	32x4	1475	1475	....	2295	2350
Columbia Light Six	Cont.	6-3⅛x4¼	115	31x4	995	985	....	....	1395
Comet C-53	Cont.	6-3½x5¼	125	33x4½	....	1985	2085	....	2985
Crawford 22-6-60	Cont.	6-3½x5¼	122½	32x4	3000	3000	3000	....	4500
Daniels D-19	Own	8-3½x5½	132	34x4¼	a4350	b4350	4350	5250	5950
Davis 71	Cont.	6-3⅜x4¼	114	31x4	....	1195	....	....	....
Davis 61-67	Cont.	6-3¼x4½	120	32x4	1595	1595	b1695	2095	2195
Dixie Flyer H-S-70	H-S.	4-3½x5	112	32x4	1175	1175	b1295	1545	1595
Dodge Brothers	Own.	4-3⅞x4½	114	32x4	850	880	....	1280 980b	1440
Dorris 6-80	Own.	6-4 x5	132	33x5	....	b3900	3950	4985b	5750
Dort 19-14	D-Ly.	4-3½x5	108	31x4	885	885	....	1315 1065k	1445 1115k
Driggs	Own.	4-2⅝x4½	104	30x3½	1275	1275	....	....	1975
Duesenberg Straight 8	Own.	8-2⅞x5	134	33x5	6500	6500	6750	7800	7800
Du Pont A	Own.	4-3⅛x5½	124	32x4½	3000	3200	....	3800	4000
Durant A-22	Cont.	4-3⅜x4¼	109	31x4	n890	890	....	1365	1365
Durant B-22	Anst.	6-3¼x4½	123½	32x4½	1600	1650	....	2250	2400
Earl 40	Own.	4-3⅞x5¼	112	32x4	1485	1095	950u	....	1795
Elcar K-4	Lyc.	4-3½x5	118	33x4	1095	1095	n1095	1345	....
Elcar 7-R	Cont.	6-3¼x4½	118	33x4	1395	1395	n1395	2065	2165
Elgin K-1	Falls.	6-3⅛x4¼	118	33x4	1345	1295	b1345	2195	2195
Essex	Own.	4-3⅜x5	108½	32x4	....	1095	....	1195k	1895 1295k
Ford T	Own.	4-3¾x4	100	30x3½	r319	s348	u285	580	645
Franklin 9-B	Own	6-3¼x4	115	32x4	1900	1950	u1750	2750	2850
Gardner T-R & G	Lyc.	4-3⅛x5	112	32x4	895	895	....	....	1595
Grant	Own.	6-3⅛x4½	116	32x4	1385	1385	....	1895	1945
Gray	Own.	4-3⅝x4	100	30x3½	....	490	....	....	760
H.C.S. Series 3	Weid.	4-3⅝x5½	120	32x4½	2400	2400	....	2850	3150
Halladay 4	Own.	4-3½x5	115	32x4	1095	1095	....	1990	2085
Halladay 6	Own.	6-3½x5	115	32x4	1595	1595	....	2295	2395
Handley-Knight	Own.	4-4⅛x4½	125	32x4½	....	....	2650	3450	3450
Hanson 30	Cont.	6-3⅜x4¼	112	31x4	....	995	....	....	....
Hanson Six 60	Cont.	6-3¼x4½	121	32x4	1595	1595	1795	b2475	2585
Hatfield A-42	H-S.	4-3½x5	115	32x4	....	1315	b1315	1950	1950
Haynes 75	Own.	6-3½x5⅞	132	34x4½	2395	b2395	2395	....	3395
Haynes 55	Own.	6-3½x5	121	33x4	1615	1595	....	2295	2595
Haynes 48	Own.	12-2¾x5	132	34x4½	2895	3595	2895	....	3895
Holmes Series 4	Own.	6-3½x4¼	126	34x4½	....	b2500	2500	b3300	3600
Hudson Super 6	Own.	6-3½x5	126	34x4½	....	b1645	1695	2570	2650 1745k
Huffman	Cont.	6-3⅝x4½	120	32x4	1395	1395	....	....	2295
Hupmobile Series R	Own.	4-3¼x5½	112	32x4	1250	1250	....	1835	1935
Jackson 638	Cont.	6-3¼x4½	121	32x4½	....	1485	b1685	2985	2985
Jewett Six	Own.	6-3¼x5	112	31x4	1065	1065	....	....	1395
Jordan MX	Own.	6-3 x4¾	120	32x4	1895	1795	....	2785	2785
Kenworthy 8-90	Own.	8-3 x5¼	130	32x4½	5000	5000	5250	6000	6000
King K	Own.	8-3 x5	120	32x4½	1795	1795	b1795	2400	2550
Kissel 45	Own.	6-3 x5½	124	32x4½	n2385	1885	2385	b2975	3075
Kline Kar 6-55-K	Cont.	6-3¼x4½	121	33x4	1790	1790	1790	2850	2890
LaFayette	Own.	8-3¼x5¼	132	33x5	3985	b4090	4090	5000	5175
Leach 999	Own.	6-3¼x5¼	134	32x4½	6500	6500	6500	6500	6500
Lexington 22	Anst.	6-3¼x4½	123	32x4½	....	1745	....	....	....
Lexington T-22	Anst.	6-3¼x4½	128	32x4½	....	....	2285	....	3350
Lexington ST-22	Anst.	6-3¼x4½	122	32x4	....	2100	....	....	....
Liberty 10-D	Own.	6-3⅛x5	117	32x4	1295	1295	b1345	2085	2245
Lincoln	Own.	8-3⅜x5	130	33x5	$3800	b3800	$3300	$3900	$4200
Locomobile 48	Own.	6-4½x5½	142	35x5	....	b7600	7600	10500	11000
Maibohm B	Own.	6-3⅛x4½	116	32x4	1395	1395	b1495	2165	2165
Marmon 34	Own.	6-3⅜x5⅛	136	32x4½	3385	b3185	3185	3685	4385
Maxwell	Own.	4-3⅝x4½	109	31x4	885	885	....	1385	1485
McFarlan 1922	Own.	6-4½x6	140	33x5	6300	b6300	6300	7500	7500
Mercer Series 5	Own.	4-3¾x6¾	132	32x4½	3950	b3950	c3950	4850	5250
Merit	Cont.	6-3¼x4½	119	32x4	1895	1895	....	....	....
Mitchell F-50	Own.	6-3½x5	120	33x4	a1490	1490	b1690	2050	2275
Mitchell F-50	Own.	6-3½x5	127	32x4½	....	....	1690	....	....
Monroe 1922-S-9	Own.	4-3¼x4½	115	32x3½	875	875	....	....	....
Moon 6-40	Cont.	6-3⅛x4¼	115	31x4	....	1295	....	....	1695
Moon 6-48	Cont.	6-3¼x4½	122	32x4	1785	1785	2285	2785	2785
Nash 691-96-97	Own.	6-3¼x5	121	33x4	1360	1390	b1540	....	....
Nash 692-94-95	Own.	6-3¼x5	127	34x4½	....	....	1540	2090	2390
Nash Four 41-4	Own.	4-3⅝x5	112	33x4	965	985	....	1485 1295k	1645 1350k
National BB	Own.	6-3½x5¼	130	32x4½	a2475	b2475	2375	3725	b3250
Noma 3C	Cont.	6-3¼x4½	128	32x4½	2000	b2100	c2200	....	3200
Noma 1D	Bea.	6-3½x5¼	128	32x4½	3000	b3100	c3200	....	5500
Norwalk 430-KS	Lyc.	4-3½x5	116	32x3½	..	1035	....	....	....
Oakland 6-44	Own.	6-2¾x4¾	115	32x4	1120	1145	b1265	1685 1285k	1785
Ogren 6 T De Luxe	Cont.	6-3⅝x5¼	134	33x5	b3750	3750	3850	4500	4800
Oldsmobile 43-A	Own.	4-3½x5¼	115	32x4	....	1145	b1145	1645	1795
Oldsmobile 46	Own.	8-2⅞x4¾	122	33x4½	....	b1735	1735	....	2635
Oldsmobile 47	Own.	8-2⅞x4½	115	32x4	1595	b1595	....	2145	2295
Overland 4	Own.	4-3⅜x4	100	30x3½	550	550	...	850	895
Packard Single-Six	Own.	6-3⅜x5	126	33x4½	2485	2485	u2250	3175	3275
Packard Single-Six	Own.	6-3⅜x5	133	33x4½	....	u2350	2685	....	3525
Packard Twin Six	Own.	12-3 x5	136	35x5	3850	3850	3850	5240	5400
Paige 6-44	Own.	6-3½x5	119	32x4	1465	1465	u1290	1995	2245
Paige 6-66	Cont.	6-3⅜x5	131	33x4½	a2495	n2245	2195	3100	3155
Paterson 22-6-52	Cont.	6-3½x4½	120	32x4½	....	1550	1585	2595	2595
Peerless 56-S-7	Own.	8-3¼x5	125	34x4½	....	b2790	2790	3500	3790
Pierce-Arrow	Own.	6-4 x5½	138	33x5	7000	b6500	6500	8000	8500
Pilot 6-50	H-S.	6-3½x5	126	32x4½	2050	2000	2050	2950	3000
Premier 6-D	Own.	6-3⅜x5½	126¾	33x5	3150	b3100	3250	4300	5100
Premocar 6-40-A	Falls.	6-3½x4¼	117	32x4	1095	1095	...	1750	1825
R & V Knight R	Own.	4-3⅜x5	116	32x4	....	1665	....	2385	2475
R & V Knight J	Own.	6-3½x4½	127	32x4½	2475	b2475	2475	3015	3105
Reo Series B-T6 & U6	Own.	6-3⅛x5	120	33x4	1595	....	1595	2355	2435
ReVere C	Dues.	4-4½x6	131	32x4½	3200	3200	3200	....	4000
Rickenbacker A	Own.	6-3½x4¾	117	32x4	....	1485	....	1885	1985
Roamer 6-54-E	Cont.	6-3½x5¼	128	32x4½	2850	b2585	2785	3850	3850
Roamer 4-75-E	Dues.	4-4½x6	128	32x4½	3985	b3585	b3750n	....	b4650
Rolls-Royce	Own.	6-4½x4¾	143½	33x5	....	10,900	....	....	....
Saxon 125	Own.	4-3½x5	112	32x4	1195	1195	....	1795	1795
Sayers Six DP	Cont.	6-3¼x4½	118	33x4	1695	1695	....	2795	2795
Seneca L-2 & O-2	Lyc.	4-3½x5	108	30x3½	875	875	....	....	....
Seneca 50 & 51	Lyc.	4-3½x5	112	31x4	1095	1095	....	....	....
Sperling A	Supr.	4-3⅜x5	114	32x4	980	980	....	1685	1685
Standard 98	Own.	8-3¼x5	127	34x4½	2150	b2500	2500	2750	3200
Stanley	Own.	2-4 x5	130	34x4½	2800	2600	2600	3775	3850
Stanwood Six	Cont.	6-3¼x4½	118	33x4	1765	1765	....	2750	....
Star	Cont.	4-3½x4¼	102	30x3½	r319	s348	u285	580	645
Stearns-Knight SKL4	Own.	4-3⅝x5⅝	125	34x4½	2250	2250	2450	3150	3450
Stearns-Knight 6	Own.	6	....	33x4½	2700	2700	2850	3500	3700
Stephens 90	Own.	6-3½x4½	122	33x4½	1575	b1595	c1625	2450	2550
Stevens-Duryea E	Own.	6-4⅞x5½	138	35x5	7250	b6900	6800	u5600	b8900
Studebaker Light Six	Own.	6-3½x4½	112	32x4	1045	1045	....	1375	1750
Studebaker Special Six	Own.	6-3½x5	119	32x4	1425	1475	b1475	2150	2350
Studebaker Big Six	Own.	6-3⅞x5	126	33x4½	....	n1985	1785	2500	2700
Stutz	Own.	4-4½x6	130	32x4½	2950	b2990	c2990	3990	4450
Templar A-445	Own.	4-3½x5½	118	32x4	2025	2125	b2175	2785	2785
Tulsa E-1-2-3	H-S.	4-3½x5	117	33x4	1175	1175	....	....	....
Velie 48	Cont.	6-3¼x4½	115	32x4	1585	1585	b1800	2485	2485
Velie 34	Falls.	6-3½x4½	112	32x3½	1235	1235	....	1750	2085
Velie 58	Own.	6-3½x4¼	115	32x4	1395	1395	....	2085	2185
Washington 6	Cont.	6-3¼x4½	116	32x4	....	1785	....	....	....
Westcott C-48	Cont.	6-3½x5¼	125	32x4½	....	....	1890	....	2890
Westcott A-44	Cont.	6-3¼x4½	120	32x4	....	1690	n1890	....	2690
Wills Sainte Claire A-68	Own.	8-3¼x4	121	32x4½	2475	2475	....	3275	3475
Willys-Knight 20	Own.	4-3⅝x4½	118	32x4	1350	1375	....	1875	2095
Winton 40	Own.	6-3½x5¼	132	35x5	3400	b3600	3400	4450	4550

a—3-passenger. b—4-passenger. c—6-passenger. n—Sport. h—All Metal Type. k—Soft Top Type. u—Chassis Price. r—Price without starter and demountable rims. Price with starter and demountable rims $414. s—Price without starter and demountable rims. Price with starter and demountable rims $443. t—Model 47—34x4½ Tires.

Engine Make: Anst—Ansted. Bea—Beaver. Cont—Continental. Curt—Curtis. D.Ly—Dort Lycoming. G-B—Grey Beal. H-S—Herscnell-Spillman. Lyc—Lycoming. Nort—Northway. Roch—Rochester. Rut—Rutenberg. Supr—Supreme. Weid—Weidely. Wisc—Wisconsin.